the OIL AND GAS JOURNAL

APRIL 23, 1956

Underground Gas Storage Set at 2 Trillion Feet

. . . Journal survey reveals increase in capacity of 12.4 per cent during the past year

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IT'S HERE . . .

Automatic Custody Transfer at the Lease

. . . Details of the first working application of the idea

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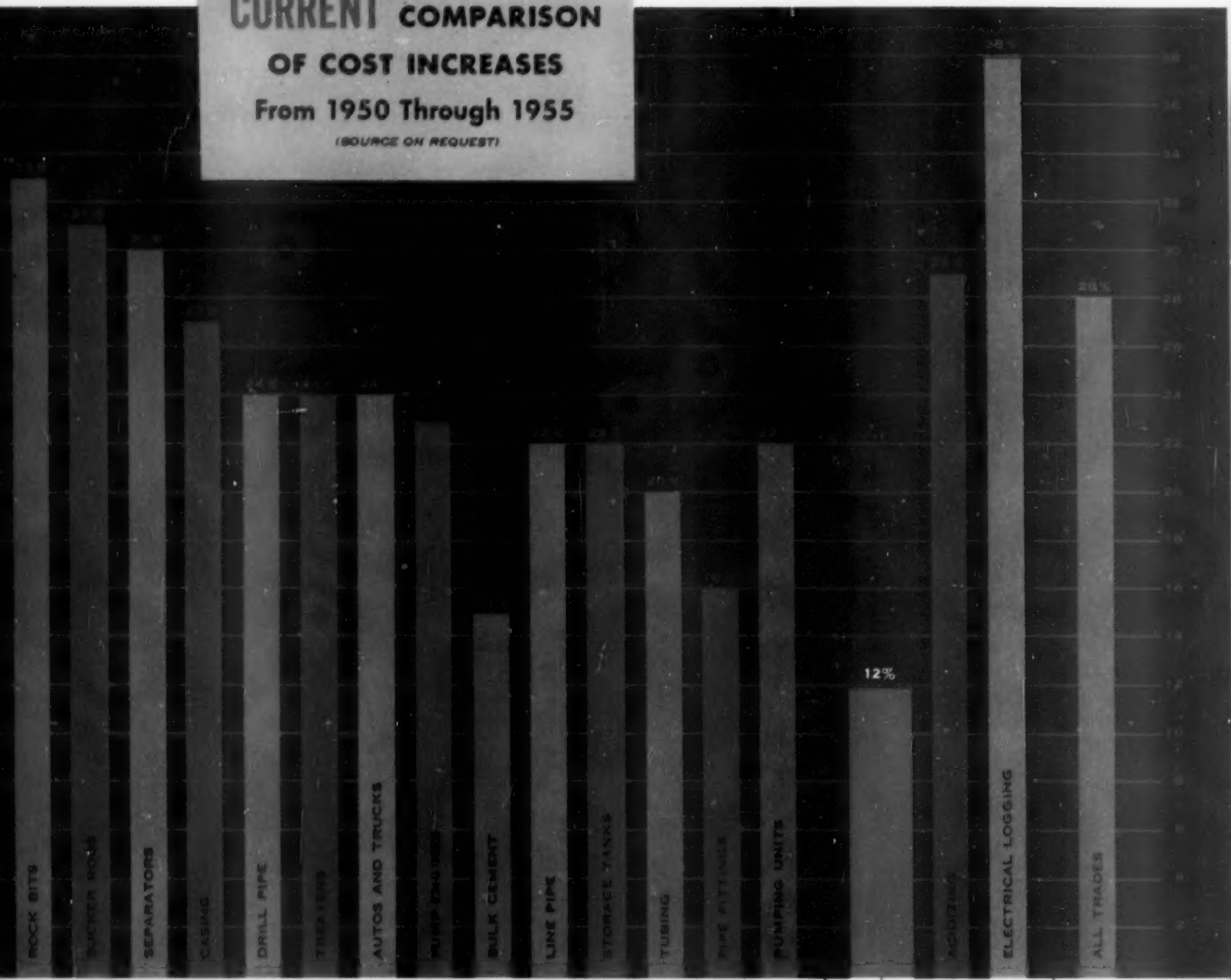
Refinery realization is up . . . . But prices must rise if crude goes up. p. 76

CURRENT COMPARISON OF COST INCREASES From 1950 Through 1955

(SOURCE ON REQUEST)



CEMENTING

Your costs increased these last 5 years ...the chart shows an average of 23.3%. But cementing cost went up only 12%...which illustrates Halliburton's policy of performing service beyond the fee, service above all. Research, our most important service, helps reduce cost.

HALLIBURTON OIL WELL CEMENTING COMPANY

DUNCAN, OKLAHOMA

"Progress In Service Through Research"

A Glance Ahead . . . . at press time

These trends will make TOMORROW'S NEWS

In spite of announced plans for a major offshore gathering system, many coastal operators still think small systems directly connected to shore will come first.

They point out that an underwater line paralleling the coast would traverse a lot of barren areas, that handling a variety of crudes would add complexity to such a system. What they expect: Short lines from producing areas to the closest shore terminal. These would be extended at sea to connect new producing fields, if close. Isolated fields—and small fields—they think, will continue to be serviced by barge for quite a while.

The latest wrinkle in refining processes is two-stage fluid catalytic cracking. Shell will take the wraps off its new technique next month at the A.P.I. meeting in Montreal in a paper discussing the new unit at Anacortes, Wash.

Look for the strike at Shell's 50,000-bbl. Anacortes, Wash., refinery to be long and bitter. Workers at the plant are getting a lot of financial help. In addition to money from the O.C.A.W. headquarters, local unions all along the West Coast are kicking into the strike fund. The strike at the plant, which opened only last December, started March 24 after employes turned down 6 per cent, or 15 cents an hour, increase accepted by many plants in March.

The free-piston engine, as a possible adjunct to the gas turbine, has made its experimental bow in the U. S.

Although it was abandoned for the present by one major manufacturer, General Motors has unveiled an experimental car using a free-piston engine that will "burn anything" from gasoline to Bunker C—including peanut oil. Principal advantage of the free-piston engine is that it provides the gas turbine with combustion gas at a relatively low temperature of 900° F., permitting turbine blades to be made of non-critical materials.

Look for an oil company to come up first with a new synthetic rubber with all the properties of the natural product at a competitive cost.

Work on the new synthetic is being pushed in the laboratories of a couple of oil companies and several rubber concerns. Some rubber companies already have announced they can make the product. But so far they haven't licked the cost problem. Their rubber could compete with natural at 40-plus cents a pound but not at current prices. An oil company reportedly has the cost down to earth and may lead the pack in getting into production.

Russia will make at least a nominal bid for Western European oil markets in the next 5 years. Just a hint of what the Soviet has in mind was revealed by the Russian delegate to the United Nations Economic Commission for Europe in Geneva.

Ivan G. Kabanov, in a major policy speech, invited other European delegates to look to the East for their oil and coal needs of the future. An energy supply is conceded to be the most important single element in Western Europe's rapidly expanding economy. Kabanov pointed out that Russia confidently expects to be producing 2,700,000 bbl. daily by 1960—nearly double her present 1,400,000 bbl. daily.

The OIL AND GAS JOURNAL

APRIL 23, 1956 • VOLUME 54 • NUMBER 51

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TECHNOLOGY–OPERATION

Drilling—Production

Lease Automatic Custody Transfer Becomes a Reality **96**

by S. H. Pope and R. M. Stuntz

This article gives details of the first installation to sell oil from a lease automatically. The automatic battery uses parallel dump tanks and is in everyday operation, delivering oil from a Gulf Oil Corp. lease to Kaw Pipe Line Co.

Special Logging Package Saves $1,000 per Well **109**

by Joe D. Owen

In Quinduno field of Texas the best logging combination for quantitative formation analysis in saline muds is the gamma ray, Microlaterolog, and Laterolog.

Latest in Mobile Drilling Platforms Goes to Work **129**

by Ed McGhee

Newest mobile drilling platform in the Gulf of Mexico is the Scorpion of Zapata Off-Shore Co. It is a self-contained steel island for drilling in 80 to 100-ft. water.

Refining—Processing

How Ethyl Keeps Rein on Upkeep Costs—2 **103**

by Larry Resen

An outstanding part of Ethyl's maintenance program is its valve repair shop which handles all valve repair for Houston plant.

100-Octane Gasoline by Once-Through Platforming **105**

by Davis Read and P. C. Weinert

Data from commercial units show that 100-octane leaded reformate can be made by Platforming, operating under once-through conditions without regeneration. Stocks used included both Middle East and Mid-Continent naphthas.

Cosden Building Styrene Plant in West Texas **108**

Continuous Automatic Sampling—3: Don't Sell Sampling Short **119**

by R. P. Johnson

Use of automatic sampling devices may provide means for obtaining truly representative samples, eliminating inaccuracies of manual methods.

On-the-Job—In the Plants: Solving Petrochemical Plant Problems **123**

by Larry Resen

This article gives solutions to some interesting problems of resin production, including reclamation of catalyst and mixing of viscous slurries.

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A polyvinylchloride blanket seals a storage tank and reduces vapor loss by 80 per cent.

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Lease Automatic Custody Transfer Becomes a Reality **96**

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by R. P. Johnson

Use of automatic sampling devices may provide means for obtaining truly representative samples, eliminating inaccuracies of manual methods.

Pipeline Patrol: Measuring Moisture in Gas Pipelines **145**

Here's a new instrument to continuously detect and record very small concentrations of water vapor in natural gas.

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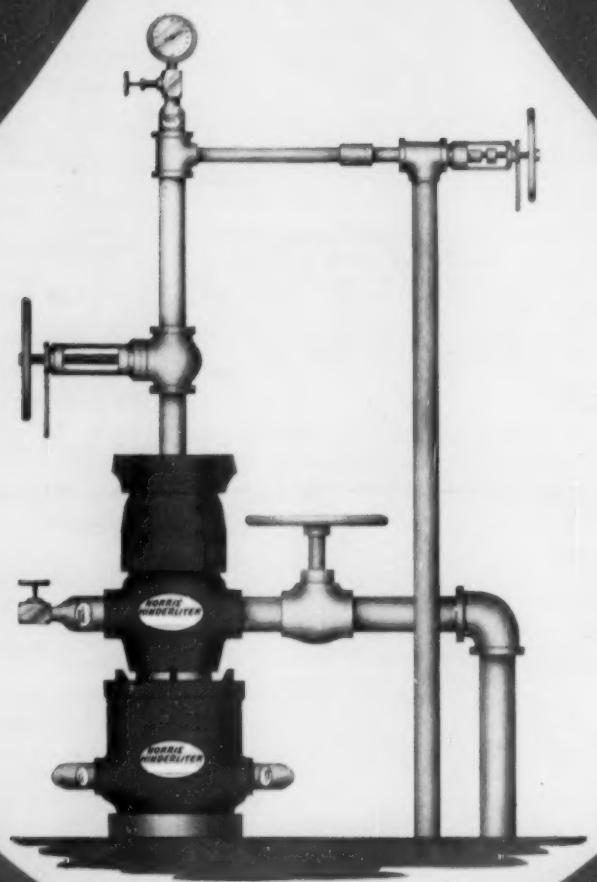

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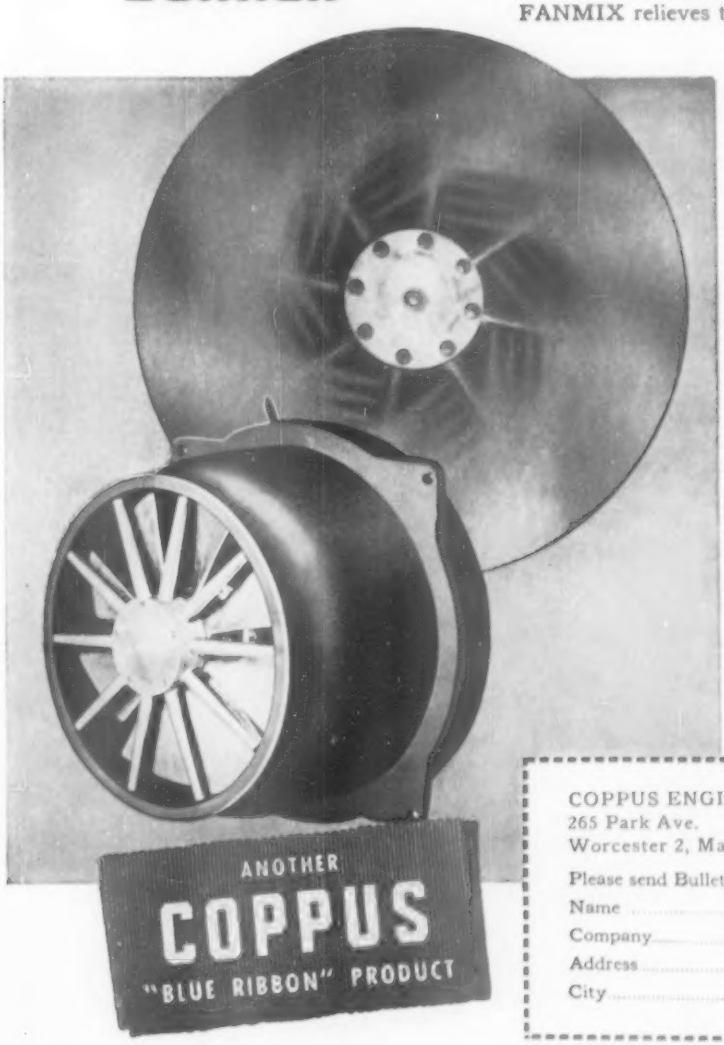

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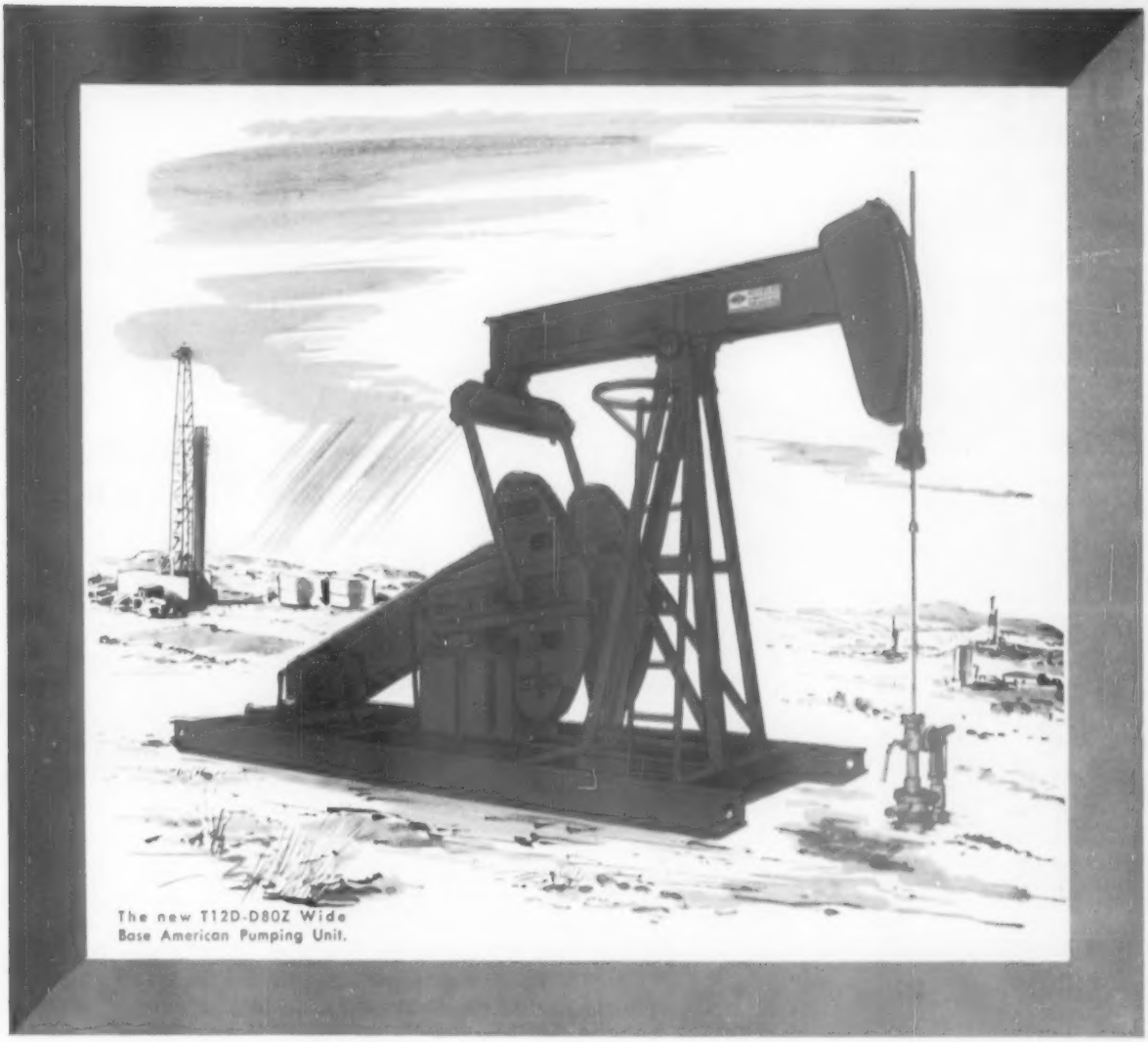

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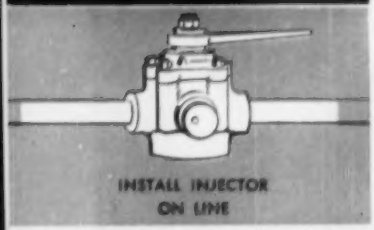
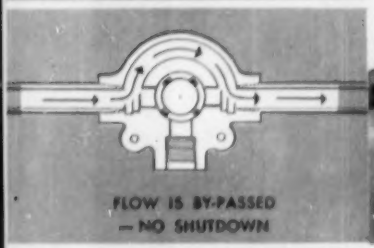
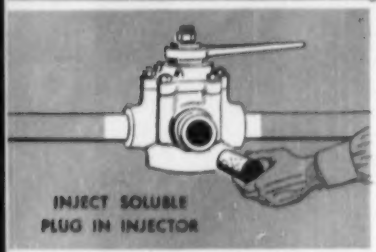
KINNEY PLUG INJECTOR



INSTALL INJECTOR ON LINE



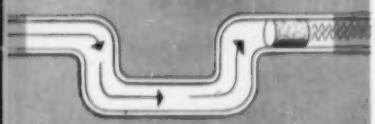
FLOW IS BY-PASSED — NO SHUTDOWN



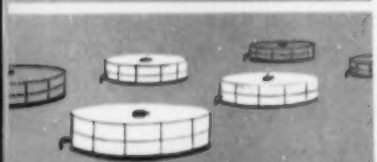
INJECT SOLUBLE PLUG IN INJECTOR

PRESSURE PUSHES PLUG

PLUG TURNS ALL BENDS IN PIPE



AND CLEANS PARAFFIN AS IT MOVES



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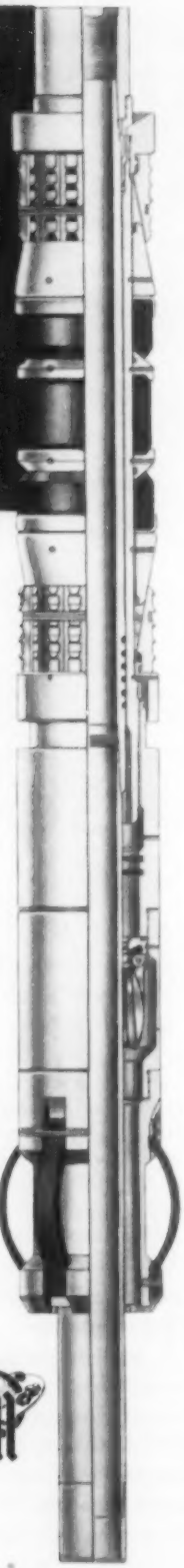

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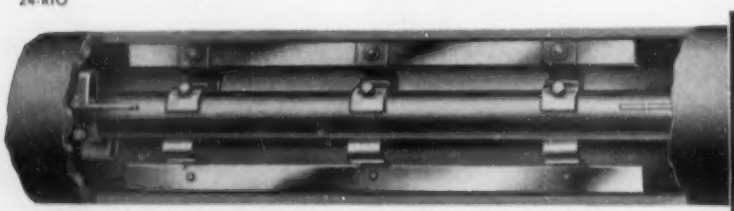

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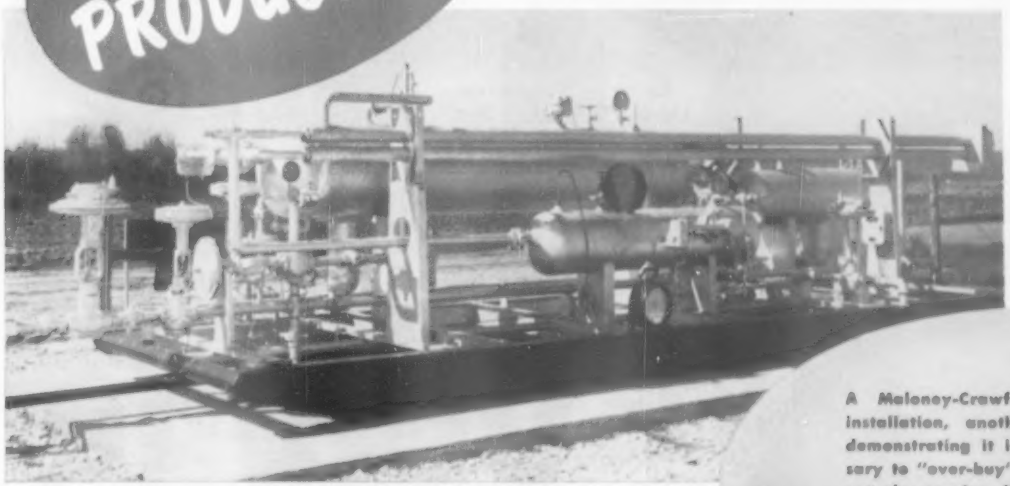

A Maloney-Crawford Dricold installation, another instance demonstrating it is not necessary to "over-buy" capacity to get the service desired when using M-C separators and treaters.

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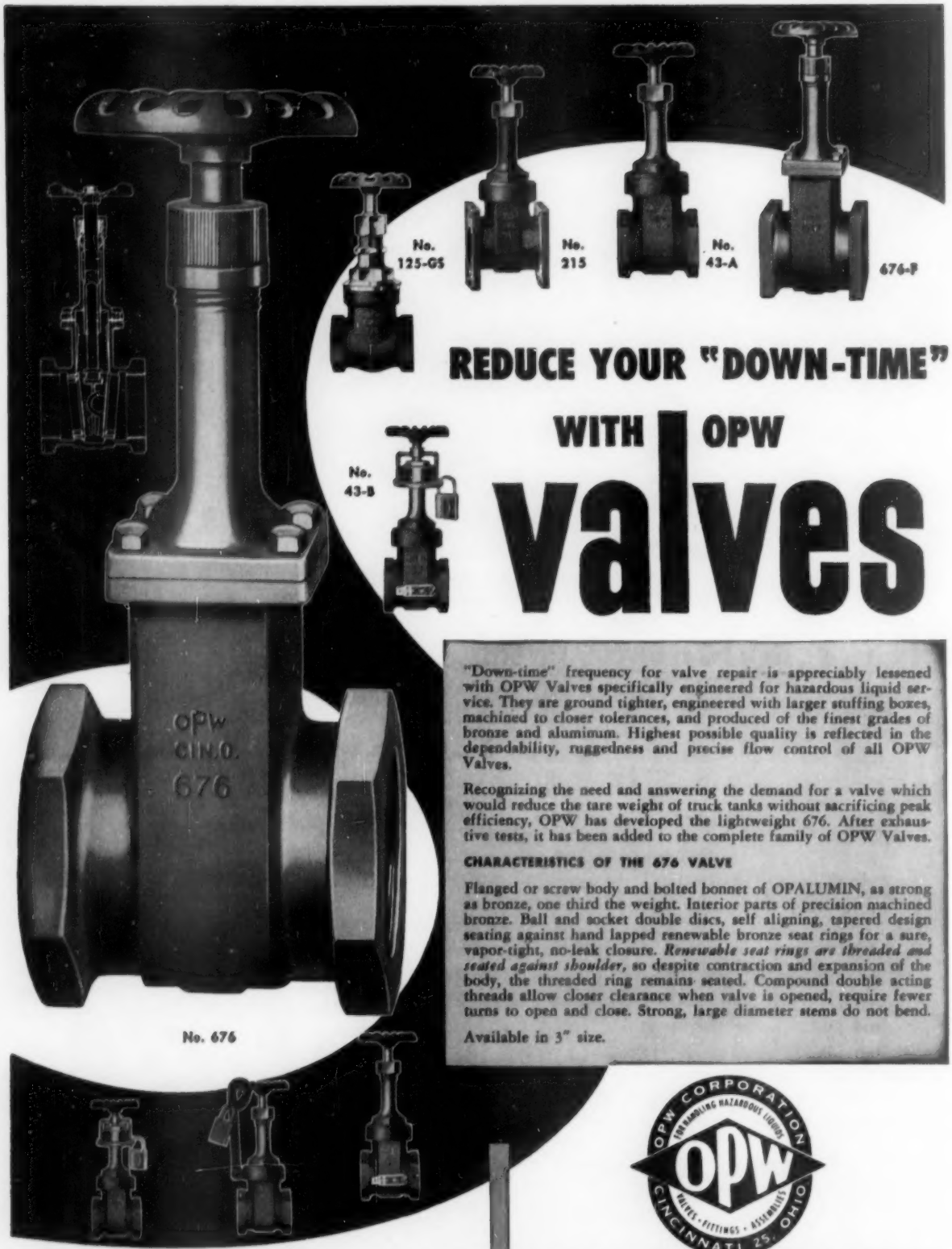
A M-C representative is available at any one of the following locations to discuss how Dricold can benefit you: Chickasha, Corpus Christi, Cushing, Dallas, Fort Worth, Hobbs, Houston, Lafayette, Midland, New Orleans, Odessa, Oklahoma City, Pampa, San Angelo, Tulsa, Wichita Falls, Calgary, Edmonton, Regina, or Virden.

MALONEY-CRAWFORD TANK AND MANUFACTURING CO.

FACTORY AND GENERAL OFFICE: 38 North Peoria—Box 659—Tulsa, Oklahoma
EXPORT REPRESENTATIVE: Baird Lines—1017 Grand Central Terminal Bldg., New York 17, N.Y.
CANADIAN REPRESENTATIVE: Maloney-Crawford Tank & Service Company, Ltd.—Edmonton.
TEXAS PANHANDLE REPRESENTATIVE: Atlas Tank Company—Pampa, Texas.

MALONEY-CRAWFORD TANK & MFG. CO.



REDUCE YOUR "DOWN-TIME" WITH OPW valves

"Down-time" frequency for valve repair is appreciably lessened with OPW Valves specifically engineered for hazardous liquid service. They are ground tighter, engineered with larger stuffing boxes, machined to closer tolerances, and produced of the finest grades of bronze and aluminum. Highest possible quality is reflected in the dependability, ruggedness and precise flow control of all OPW Valves.

Recognizing the need and answering the demand for a valve which would reduce the tare weight of truck tanks without sacrificing peak efficiency, OPW has developed the lightweight 676. After exhaustive tests, it has been added to the complete family of OPW Valves.

CHARACTERISTICS OF THE 676 VALVE

Flanged or screw body and bolted bonnet of OPALUMIN, as strong as bronze, one third the weight. Interior parts of precision machined bronze. Ball and socket double discs, self aligning, tapered design seating against hand lapped renewable bronze seat rings for a sure, vapor-tight, no-leak closure. *Renewable seat rings are threaded and seated against shoulder,* so despite contraction and expansion of the body, the threaded ring remains seated. Compound double acting threads allow closer clearance when valve is opened, require fewer turns to open and close. Strong, large diameter stems do not bend.

Available in 3" size.

No. 676

GATE VALVES • EMERGENCY VALVES • CROSS CHECK VALVES • CROSS VALVES • CHECK VALVES • GLOBE VALVES • PRESSURE RELIEF VALVES • COMPRESSION CHECK VALVES • LOADING VALVES

OPW CORPORATION
2731 COLERAIN AVE. • CINCINNATI 25, OHIO

RUGGED AND RELIABLE

GUIBERSON'S

Type L30 *Deep Well Packer*

Two-piece G2 rubbers with metal spacer are interchangeable and optional at no extra cost.

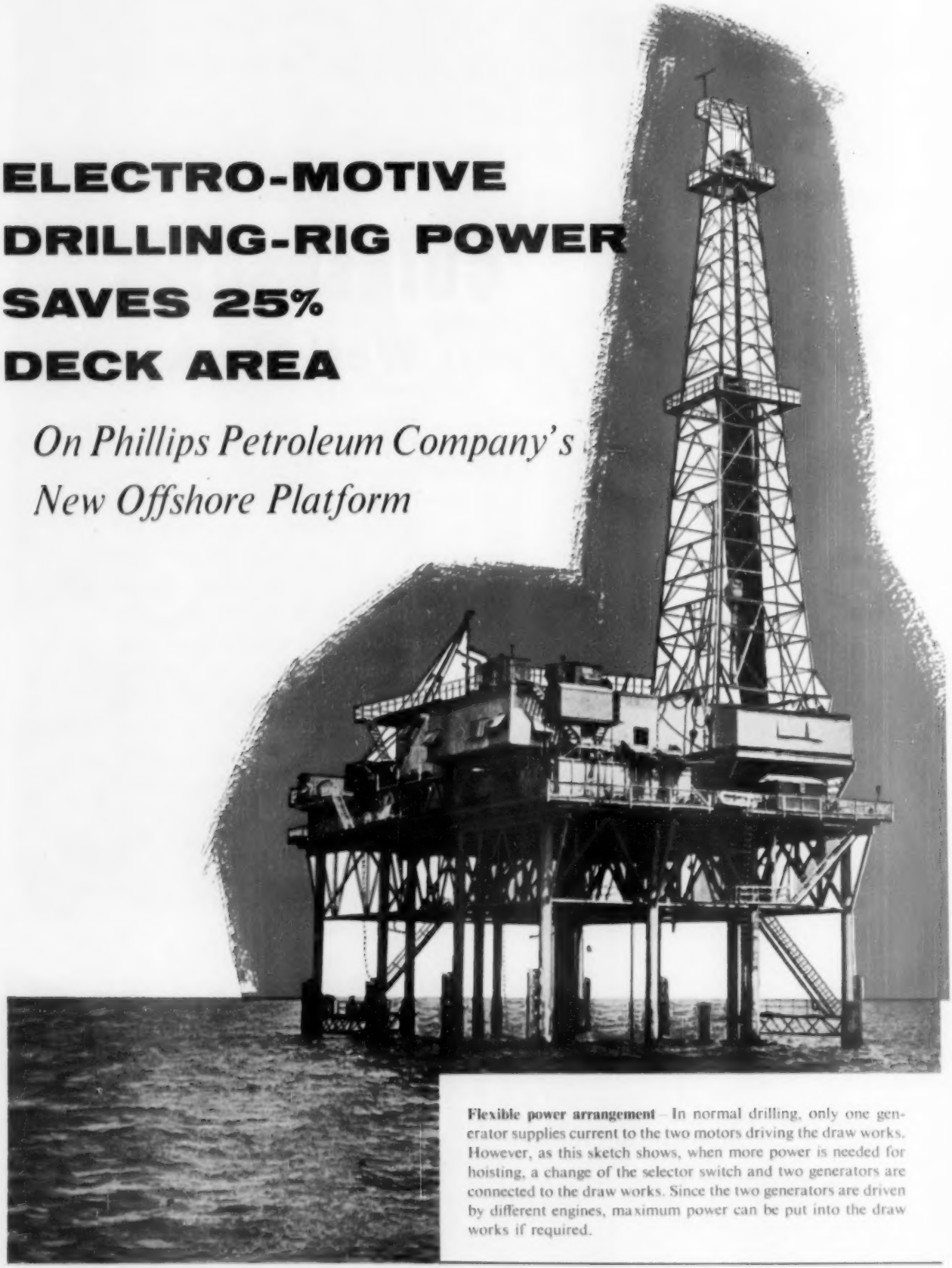
For deep well work with high temperatures and pressures, use Guiberson's dependable L30 Packer. It will give you long valve travel (30 inches) with minimum overall length at no extra cost. You can pull the L30 surely and safely. The fast-action automatic latch, protected by a positive anti-lock device that assures ready release, snaps easily into latched position. Tough, long-wearing friction pads supply ample drag. Packing rubbers of advanced design will not vulcanize to the casing wall. All these features are available on the L30 or the L8 with 8" valve stroke in a wide range of casing sizes. For circulating *above* the packer, Type L30P or L8P with perforated mandrel is available.

Better Be Safe Than Sorry

THE
GUIBERSON
CORPORATION
ESTABLISHED 1919 • DALLAS, TEXAS, U. S. A.
Sold By Leading Oil Field Supply Stores Everywhere

ELECTRO-MOTIVE DRILLING-RIG POWER SAVES 25% DECK AREA

On Phillips Petroleum Company's New Offshore Platform



Flexible power arrangement – In normal drilling, only one generator supplies current to the two motors driving the draw works. However, as this sketch shows, when more power is needed for hoisting, a change of the selector switch and two generators are connected to the draw works. Since the two generators are driven by different engines, maximum power can be put into the draw works if required.

Most compact drilling rig in the Gulf—and farthest offshore of any yet constructed—is Phillips Petroleum Company's new unitized rig assembled on a Dome "A" platform now working 40 miles off the Louisiana shore. The platform measures only 85 by 140 ft.

Phillips chose Electro-Motive Diesel-Electric power for this new rig because it gives greater flexibility in placing equipment—saves approximately 25% in high-cost deck area.

The integrated Electro-Motive Power Plant consists of two 875-H.P. General Motors 567C Diesel engine-generator sets supplying power to five d.c. motors which drive the drilling equipment. It features simplified control and rugged dependability at a cost far below that of the few previous attempts at Diesel-Electric drives, and compares favorably with Diesel-mechanical drives.

For further information on this efficient, lower-cost drilling-rig power, write or call your nearest Electro-Motive representative. Electro-Motive Division offices located in the "oil patch" at Tulsa and Houston with other sales offices in New York City, Chicago, Jacksonville, St. Louis and San Francisco.

Features of Electro-Motive Drilling-Rig Power

Completely Integrated Design—Each of the major components designed and built to work together—*one* manufacturer—*one* source of service responsibility.

Maximum Portability—All components on skids with weight reduced to a minimum. Units are ruggedly built to withstand handling. No position problem—slashes setup and moving time on land rigs.

Unmatched Flexibility—At a flick of the selector switch on the driller's control panel, power can be selected from one or more generators to meet any power requirement.

Simplified Control—Centralized position of all controls for driller's convenience—continuously variable drawworks speed control and complete rotary table torque control at the driller's finger tips.

Lower Drilling Costs—Lower first cost and lower cost per well drilled. Smooth electric power—flexible control—means less downtime, speeds drilling.

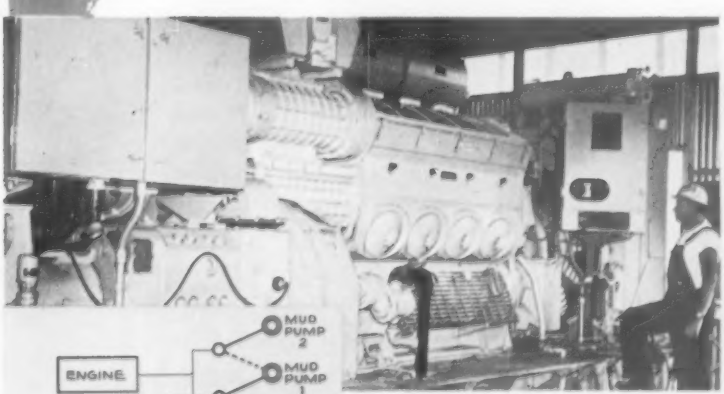
COMPLETE NATIONAL SERVICE AND PARTS AVAILABILITY

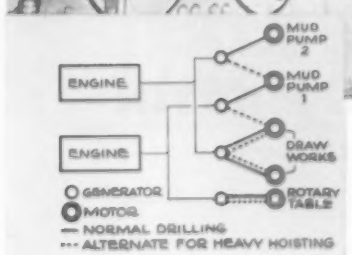
ELECTRO-MOTIVE DIVISION
GENERAL MOTORS

La Grange, Illinois · *In Canada: GENERAL MOTORS DIESEL LTD., London, Ontario*

Petroleum Industry Sales Offices: 1008 Philtower Building, Tulsa, Oklahoma, and 1420 Melrose Building, Houston, Texas

World's Largest Builder of Heavy-Duty Diesel Engines and Electric Traction Equipment





Quick, easy moves—The entire Electro-Motive power package weighs 70 tons. About 95% of the total weight of the drilling equipment on the platform can be moved with three main lifts.

Driller's control—At his position at the draw works the driller has control of all the Diesel-Electric equipment, including provisions for safety shutdown. Control panel behind the driller carries selector switch, engine speed, mud pump, hoist and rotary table controls as well as warning lights and safety switches.

Double-Barreled SAVINGS...

when you use

MARTIN PLUNGERS

1 SAVE ON PLUNGER COSTS

One Martin Plunger will make many long runs, with only the rings being replaced. A set of rings costs only one fourth as much as a new plunger. Thus it is easy to figure the savings on the plunger alone.

2 SAVE ON BARREL COSTS

Metal to metal wear is eliminated. The resilient rubber & duck rings are so much easier on the barrel surface that barrels usually last several times longer. Here too is an important item in pump costs.

MORE BARRELS IN THE TANK TOO because of better seal, freer travel in the barrel and longer runs. AVAILABLE for your pump and your well, regardless of diameter, or depth or well condition. Get catalog No. 4 and read how to make selection and installation.

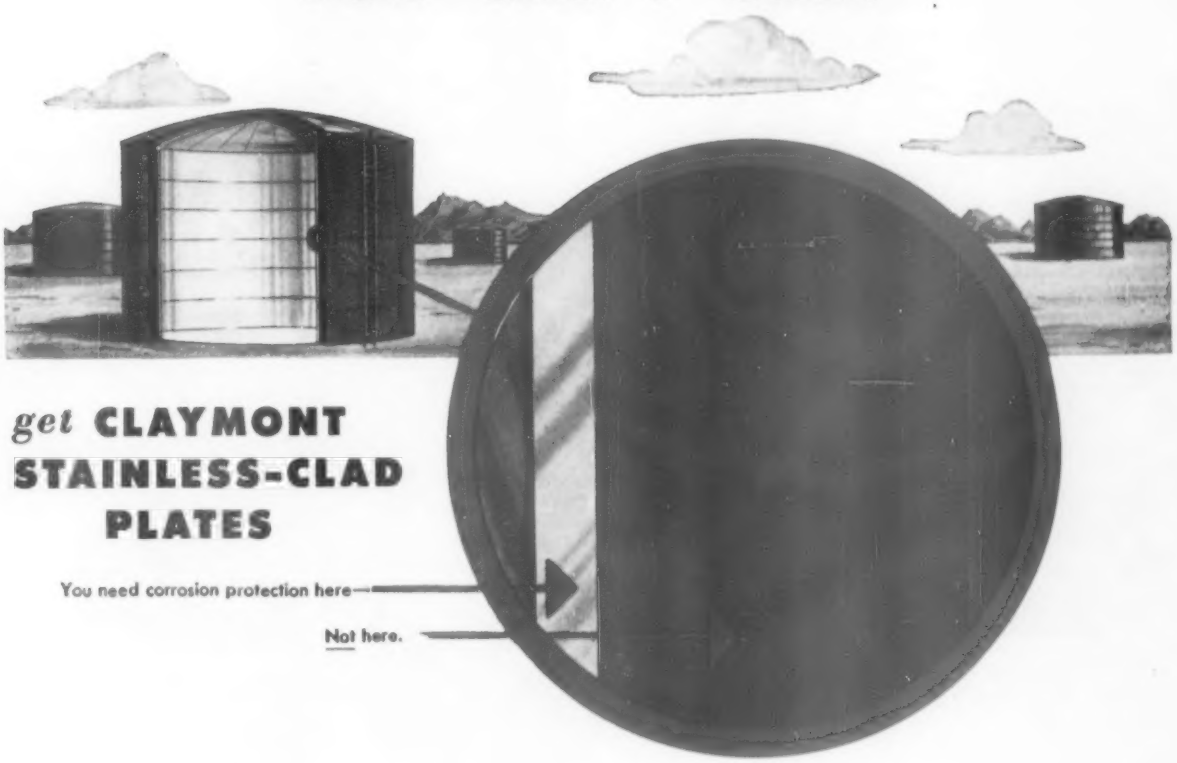
MARTIN PLUNGERS ARE SOLD THRU SUPPLY COMPANIES

JOHN N. MARTIN

Manufacturer

9 W. BRADY • TULSA, OKLA.

WHY PAY FOR STAINLESS STEEL YOU CAN'T USE?



get CLAYMONT STAINLESS-CLAD PLATES

■ You pay only for the stainless steel you can use when you buy Claymont Stainless-Clad Steel Plates. That's because these plates combine the low cost of the carbon steel backing with the corrosion resistance of the stainless steel cladding. This means that Claymont Stainless-Clad Steel Plates give the same kind of protection that you expect from much-more-expensive solid stainless steel.

Produced in our plant to exacting standards, these plates are manufactured with painstaking care under personalized supervision. What's more, our facilities provide definite assurance of prompt delivery.

It's quite likely that you can use this economical protection to great advantage in your fabrication of tanks, vessels, processing equipment and other applications. Why not get the full details today? Just contact our nearest sales office, or write to Wickwire Spencer Steel Division, The Colorado Fuel and Iron Corporation, P. O. Box 1951, Wilmington, Delaware.

CF&I *Claymont Steel Products*

Products of Wickwire Spencer Steel Division • The Colorado Fuel and Iron Corporation

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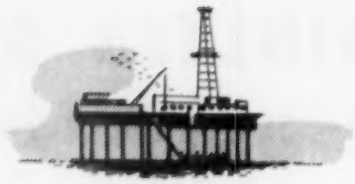
3413

Carbon and Alloy Steel Plates • Flanged and Dished Heads • Manhole Fittings and Covers • Large Diameter Welded Steel Pipe • Flame Cut Steel Plate Shapes
CF&I Lectro-Clad Nickel Plated Steel

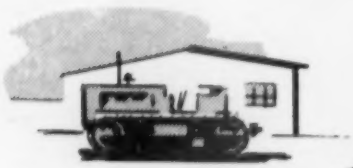


VarTung paints have proved superior to others tested on multi-million dollar rigs operated by The Offshore Company, Baton Rouge, La.

Crosby's VarTung Marine Spar Varnish and Porch & Marine Deck Enamels are especially formulated to provide maximum protection from salt water, sunlight, grease, acids, soaps, detergents, alkalies and other weathering agents. Use them to protect and beautify your boats, barges and other marine equipment.

Cut upkeep costs on pumping stations, piping, fencing and other properties with VarTung Aluminum Paint, formulated with 100% pure American tung oil varnish.

Crosby's VarTung exterior paints—including an unusually brilliant Outside White—will add years of life to your shelters, houses, office buildings and other wood or metal structures.



Protect your expensive equipment and machinery with VarTung primers and finishes. A variety of colors to select from.

To protect and beautify floors, woodwork, paneling, furniture or sporting equipment Crosby offers you a complete line of rich-bodied, durable tung oil varnishes, the least of which is equal or superior to the average **marine spar** varnish being offered today.

a TUNG OIL PAINT for every purpose!

As the result of months of testing and research in its modern, scientific laboratory at Picayune, Mississippi, Crosby has formulated a complete line of long-lasting, exceptionally durable paints to meet the exacting requirements of the oil and gas industry.

Field tests have proved that Crosby's VarTung paints and varnishes are far superior to any other in their protective qualities and durability. The secret of this superiority is the fact that only pure, polymerized American *tung oil* is used in these formulations, giving you a paint product that is easy to apply, quick drying and will outlast others by years.

If you are interested in making a substantial savings in your maintenance costs, insist on VarTung paints or varnishes on your next order.

If your local dealer cannot supply you, write direct for complete information and industrial prices.

CROSBY FOREST PRODUCTS COMPANY

Picayune, Mississippi

GRANT

GRANT
OIL TOOL COMPANY

No. 1 of a series on how Grant specializes in just one job: Engineering the Tools that help you drill wells better.

This angle on reamers makes good sense – and better hole ...only Grant has it!

Model 1530
Regular Reamer

By angling the cutters on Grant Reamers *to the right*, you get three important advantages that make Grant the logical, sensible choice for reaming or stabilizing in all formations...

1. Grant's "angled right" cutters provide the shearing and cutting action that slices away the formation. A Grant always *cuts* its way through, producing a round, full-gauge hole.

2. By angling cutters *right*, Grant Reamers have a tendency to rise. You can't cork-screw the reamer into tight hole—an exclusive Grant feature!

3. With cutters angled to the *right*, a Grant Reamer requires application of the downward weight necessary for positive reaming action.

But right angled cutters are not all! There are *no welds* of any kind on this forged steel body, insuring maximum strength and ruggedness. All cutter parts subject to wear are components of one discardable assembly. A wrench is all you need to dress your Grant for another run. More sense-making, money-saving Grant features!

Cross section of Grant Reamer Cutter Assembly. Cutter pins and bushings are dove-tailed into the Reamer body so that they cannot come out under any conditions!

3 Blade Wall Scraper | Underreamer | Cushion Stabilizer | Driblade Stabilizer | Model 6480-A Reamer Near Bit Type

Whether you're reaming or stabilizing – or both – there is a Grant 3, 6 or 9-point Reamer and the proper cutter type for the job. To get the complete story, simply write for Bulletin 62, or ask the Grant field man in your territory for the full details.

Get the facts before you—today!

GRANT

THE MAGIC WORD

FOR BETTER OIL FIELD SUPPLIES AND SERVICE

Miraculous is really the word for the service that the Misco Kid can give when the chips are down. All you have to do is call for Misco at any of these strategic locations in a six-state area, and you, too, can get the tops in oil field supplies from personnel who understand your problems.

WHERE YOUR BUSINESS IS ALWAYS GOOD BUSINESS

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Madison
Plainville
Russell

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WEST VIRGINIA
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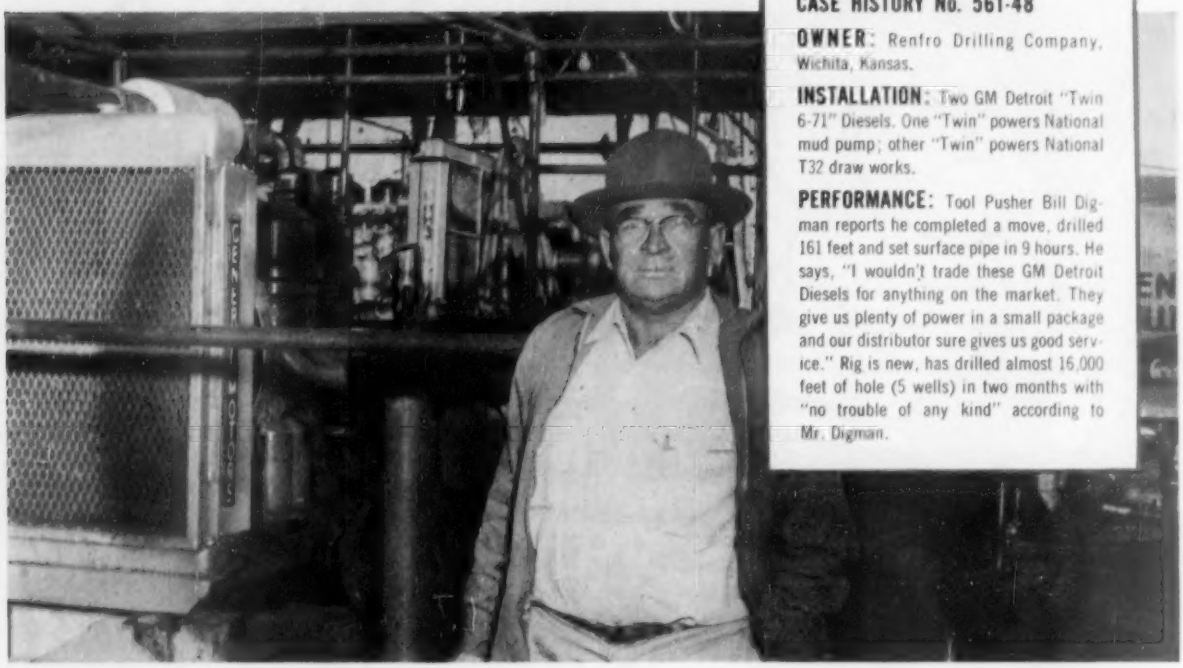
Makes Move—Drills 161 Feet—Sets Surface

ALL IN 9 HOURS



GM DETROIT DIESEL
CASE HISTORY No. 561-48

OWNER: Renfro Drilling Company, Wichita, Kansas.

INSTALLATION: Two GM Detroit "Twin 6-71" Diesels. One "Twin" powers National mud pump; other "Twin" powers National T32 draw works.

PERFORMANCE: Tool Pusher Bill Digman reports he completed a move, drilled 161 feet and set surface pipe in 9 hours. He says, "I wouldn't trade these GM Detroit Diesels for anything on the market. They give us plenty of power in a small package and our distributor sure gives us good service." Rig is new, has drilled almost 16,000 feet of hole (5 wells) in two months with "no trouble of any kind" according to Mr. Digman.

JIMMY DIESEL'S MAINTENANCE TIPS

Your GM Detroit Diesel is built to stay on the job day in and day out for a lifetime of hard work. You'll get even better service from your engine if you have your GM Detroit Diesel distributor or dealer set up a preventive maintenance program for you. Call him today, and remember—Preventive Maintenance Doesn't Cost, It Pays.

Jimmy Diesel

DETROIT DIESEL
Engine Division of
General Motors
Detroit 28, Michigan

YOU SPEND more time drilling—less time moving—with a General Motors Detroit Diesel on your rig because this 2-cycle Diesel packs more power in a smaller, lighter engine that lets you make faster, easier moves usually without special road permits.

And with a GM Detroit Diesel you make hole faster, too. For its snappy 2-cycle operation with power on every piston downstroke gives you action *right now* when the driller hits the throttle. That means faster round trips, more time on bottom, quicker hole completion wherever you're drilling.

Your local GM Detroit Diesel distributor or dealer can give you full details on GM Detroit Diesel power for your drilling rigs—or for servicing or fracturing units. See him today or write direct for more information.

Single Engines . . . 30 to 300 H.P. *Multiple Units . . . Up to 895 H.P.*

America's Largest Builder of Diesel Engines

GENERAL MOTORS CORP., DIESEL ENGINE SALES, PETROLEUM INDUSTRY, 1504 PHILTOWER BLDG., TULSA, OKLAHOMA

ALABAMA—Birmingham, Montgomery
ARMSTRONG EQUIPMENT CO.

CALIFORNIA—Berkeley
WEST COAST ENGINE & EQUIPMENT CO.
El Monte, Long Beach, Los Angeles
ANDERSON-O'BRIEN CO.

COLORADO—Denver
THE COLORADO BUILDERS' SUPPLY CO.

ILLINOIS—Mt. Carmel
WESTERN SERVICES, INC.

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DIESEL EQUIPMENT CO., INC.

LOUISIANA—Shreveport, Alexandria
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GEORGE ENGINE CO., INC.

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PENINSULAR DIESEL, INC.

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WESTERN MACHINERY & ENGINE CO.

NEW MEXICO—Albuquerque
HARRY CORNELIUS CO.

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GENERAL DIESEL AND EQUIPMENT CO.

OKLAHOMA—Oklahoma City, Tulsa
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CATE EQUIPMENT CO., INC.

WYOMING—Casper
THE COLORADO BUILDERS' SUPPLY CO.

IN CANADA—Distributors in all key locations, under
GENERAL MOTORS DIESEL LIMITED
London, Ontario

best way to protect pipelines...

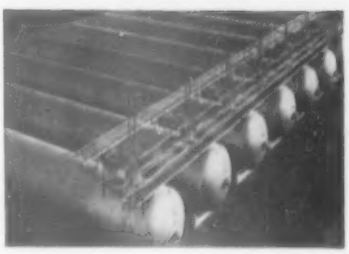
SPECIFY NO-OX-ID

Pipeline installations often represent multimillion-dollar investments. Dependable protection of that investment is of vital importance.

That's why leading pipeline companies and utilities everywhere look to Dearborn NO-OX-ID Coating and Wrapper Combinations for long-term protection—for reliable insurance against corrosion leaks and deterioration.

NO-OX-ID Coatings and NO-OX-ID-ized Wrappers provide chemical and mechanical protection against moisture penetration and soil action . . . protection that lasts for decades . . . on installations under ground or under water.

On your next coating job, you'll find it pays to specify NO-OX-ID.



One application of NO-OX-ID Aluminum Protective Coating keeps outdoor storage tanks bright for years.

Why Does Industry Specify NO-OX-ID?

There are many practical, money-saving reasons NO-OX-ID has such widespread preference:

- NO-OX-ID Coatings can be hot- or cold-applied.
- Fewer "dope" kettles, trucks, and "cats" are needed.
- Saves on material, because less material coats more pipe per mile per day.
- No irritating or noxious fumes.
- Applied by hand, traveling machine or at the mill.

Like to know more?

Then clip and mail the coupon for a factual booklet, "Protecting Underground Pipe from Corrosion with NO-OX-ID and NO-OX-IDized Wrappers." Or, better still, call in your Dearborn Pipeline Engineer and talk it over.

It pays to specify

Dearborn NO-OX-ID®

For Long-Term Pipeline Protection

Dearborn Chemical Company, Dept. OG,
Merchandise Mart Plaza, Chicago 54, Ill.

Gentlemen:

☐ Please have a Dearborn Engineer call.

☐ Send me a copy of "Protecting Underground Pipe from Corrosion with NO-OX-ID and NO-OX-IDized Wrappers."

Name.....*Title*.....

Company.....

Address.....

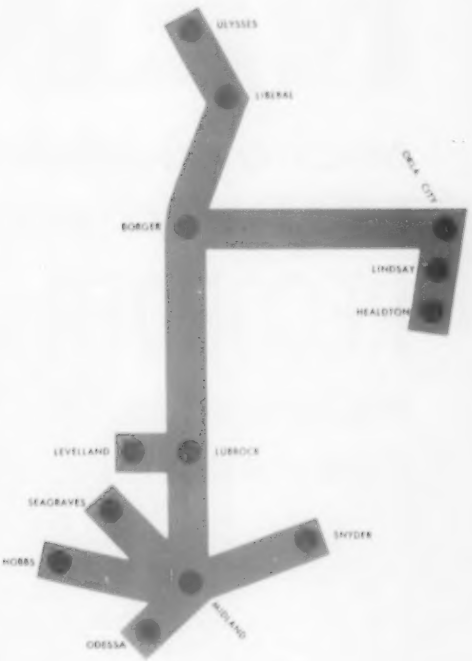
City.....*Zone*.....*State*.....

THE LONGEST AND SHORTEST

The Big Job? LUFKIN'S Air Balanced Unit with 912,000 inch pounds peak torque, 192" stroke—42,000 pounds beam rating—The Tiny Job? LUFKIN'S 20" stroke, 10,000 pounds peak torque with 4,000 pounds beam rating.

LUFKIN FOUNDRY & MACHINE COMPANY, LUFKIN, TEXAS

the Western Trail



★ Famed as a trail of adventure and commerce for early day Cowboys, the Western Trail was the longest of the cattle drive routes, stretching from San Antonio to Calgary. ★ Today's Western Trail is an ever-expanding network of Western Company stations providing engineered well services for the oil and gas industry. ★ Western's superior service — backed by continual research — is answering today's well completion problems. Because of this, more and more oilmen are taking today's Western Trail. ★ In logging, perforating, acidizing, fracturing — yes for *integrated* well services, next time **GO WESTERN**

WESTERN Engineered WELL SERVICES

THE WESTERN COMPANY

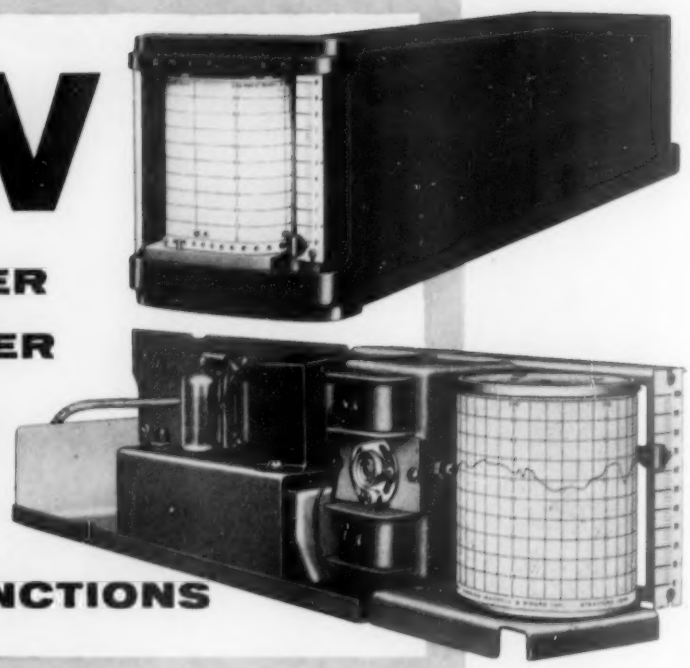
engineered well services

general offices: Midland, Texas

Texas: Odessa, Seagraves, Levelland, Snyder, Lubbock, Borger / **Oklahoma:** Lindsay, Healdton, Okla. City / **New Mexico:** Hobbs / **Kansas:** Ulysses, Liberal

NEW

MICROAMMETER
MILLIVOLTMETER
RECORDER
PERFORMS 6
ESSENTIAL FUNCTIONS



- ★ **Measures low-level dc signals with calibration accuracy within 0.5%, and sensitivity within 0.2% of span.**
- ★ **Records on 3" continuous strip chart or IBM-type card chart, with linear coordinates.**
- ★ **Positions recording pen with force many thousand times greater than usual direct-deflection electrical movements.**
- ★ **Operates on force-balance principle compensating for ambient conditions, changes in power supply and components.**
- ★ **Gives high-speed recording — up to 0.05 seconds for 63% of fullscale changes.**
- ★ **Provides span and zero adjustments for ease of calibration and zero suppression in the field, without special equipment.**

The new 'American-Microsen' Series 130 Recorder is a highly sensitive microammeter or millivoltmeter that gives positive, accurate electrical measurement and rugged, maintenance-free service. Yet the unit costs less than other recorders for the same purpose.

Heart of the Series 130 Recorder is the "Microsen" balance that converts low-level dc input signals into powerful output current to drive the recording pen. Pen position is fed back to the input. Consequently, the recording unit is force-balanced in precise relationship with the input signal. Power is ample to operate alarm contacts, which are available.

SPECIFICATIONS

POWER SUPPLY: 115 volts, 60 cycles. **POWER REQUIREMENT:** 9 watts

INPUT RANGES: Voltage – 0-20 millivolts to 0-100 volts dc. **Current** – 0-200 microamperes to 0-100 milliamperes dc. **Input Sensitivity** – 6700 ohms per volt.

ACCURACY: ± 0.5% of span. **SENSITIVITY:** ± 0.2% of span. **REPEATABILITY:** ± 0.25% of span.

EFFECT OF SUPPLY VOLTAGE: Less than 0.5% error 90-130 volts.

EFFECT OF AMBIENT TEMPERATURE: Less than 0.5% error 50° to 100° F., and less than 1% to 130° F.

RESPONSE TIME: Fast Speed – 0.2 seconds standard for 63% of fullscale input change; up to 0.05 seconds for 63% on special order. **Slow Speed** – approximately 4 times fast speed setting.

SHOCK RESISTANCE: Withstands shock up to 30 times gravity.

CHART SPEEDS: Strip Chart – 1" per hr., standard; 3" or 6" per hr. available. **Card Chart** – 1 rotation per day, standard.

SPAN ADJUSTMENT: ± 10% of span. **ZERO ADJUSTMENT:** ± 100% of span.

PRICE: $250.00 consumer net for standard models.

Write for Bulletin MG10

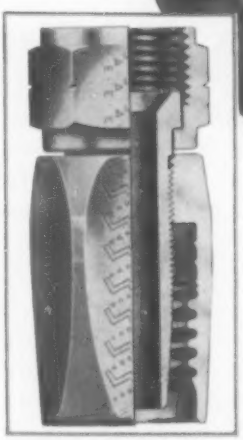
MANNING, MAXWELL & MOORE, INC.

INDUSTRIAL CONTROLS DIVISION, STRATFORD, CONNECTICUT

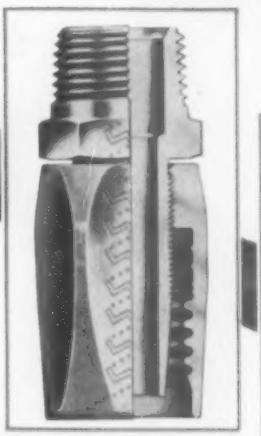
MAKERS OF 'AMERICAN-MICROSEN' ELECTRONIC TRANSMITTERS, INDICATORS, RECORDERS, CONTROLLERS, ELECTRO-PNEUMATIC VALVE POSITIONERS AND ELECTRO-HYDRAULIC CONTROL VALVE OPERATORS.

Save time-Cut costs with STRATOFLEX

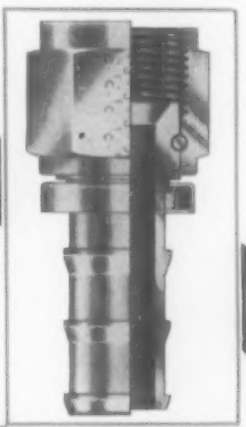
☐ **FLEXIBLE HOSE**
☐ **REUSABLE FITTINGS**



Strateflex "over the cover" SAE Swivel Hose Fitting.

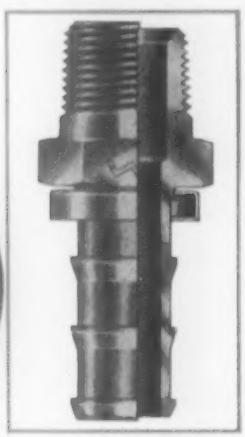


Strateflex "over the cover" Male Pipe Hose Fitting.



Strategrip J.I.C. Swivel Hose Fitting.

Strategrip Male Pipe Hose Fitting.



- For fuel lines, oil lines, water lines, and hydraulic and air controls Strateflex hose and fittings are unbeatable for trouble free service and economy. Hose is flexible, abrasion resistant, and light weight. Fittings provide a vibration-proof and leak-proof connection.
- Assemble your own hose lines quickly in the field or buy complete hose assemblies.
- Wide range of sizes and types for high and low pressure applications.

Bulk Hose, Fittings, and Hose Assemblies in Stock at All Field Stores

EXPORT DIVISION
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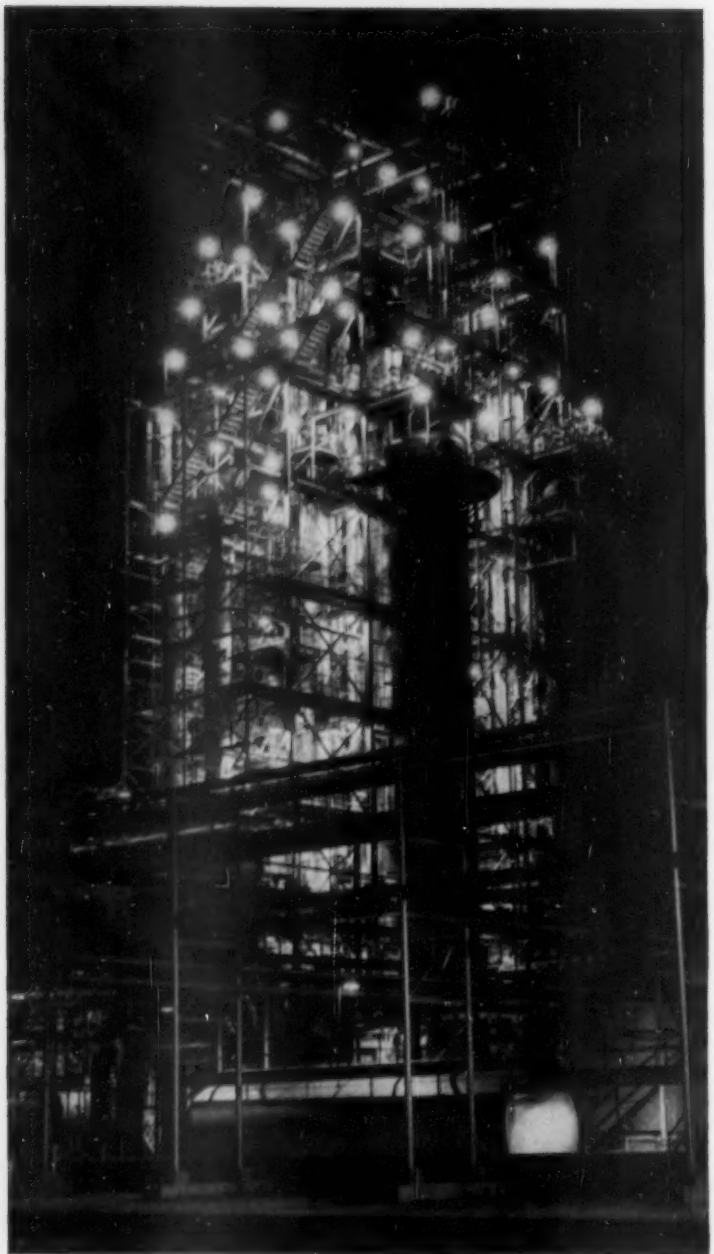
MID-CONTINENT Supply Company
MID-CONTINENT BLDG. FORT WORTH, TEXAS

M-CS6-3

THE WORLD'S LARGEST INDEPENDENT OIL FIELD SUPPLY COMPANY



Night and Day... Year after Year

durable Unibestos insulates vital piping

Pipe insulation shouldn't perform just part of the time. Any time heat escapes, efficiency drops...costs go up. Vital piping requires the kind of continuous protection that single-layer Unibestos insulation provides.

Unibestos is made with Amosite, the quality, long-fiber asbestos with superior insulating properties. Built strong to stay strong, Unibestos resists vibration and shock...withstands steam, acid, and other chemical fumes.

Single-layer Unibestos makes installation simpler, too. It's easily cut, mitered or grooved to fit bends, expansion joints —in fact, all fittings. Unibestos® pipe insulation is available in sectional form through 44″ O.D.

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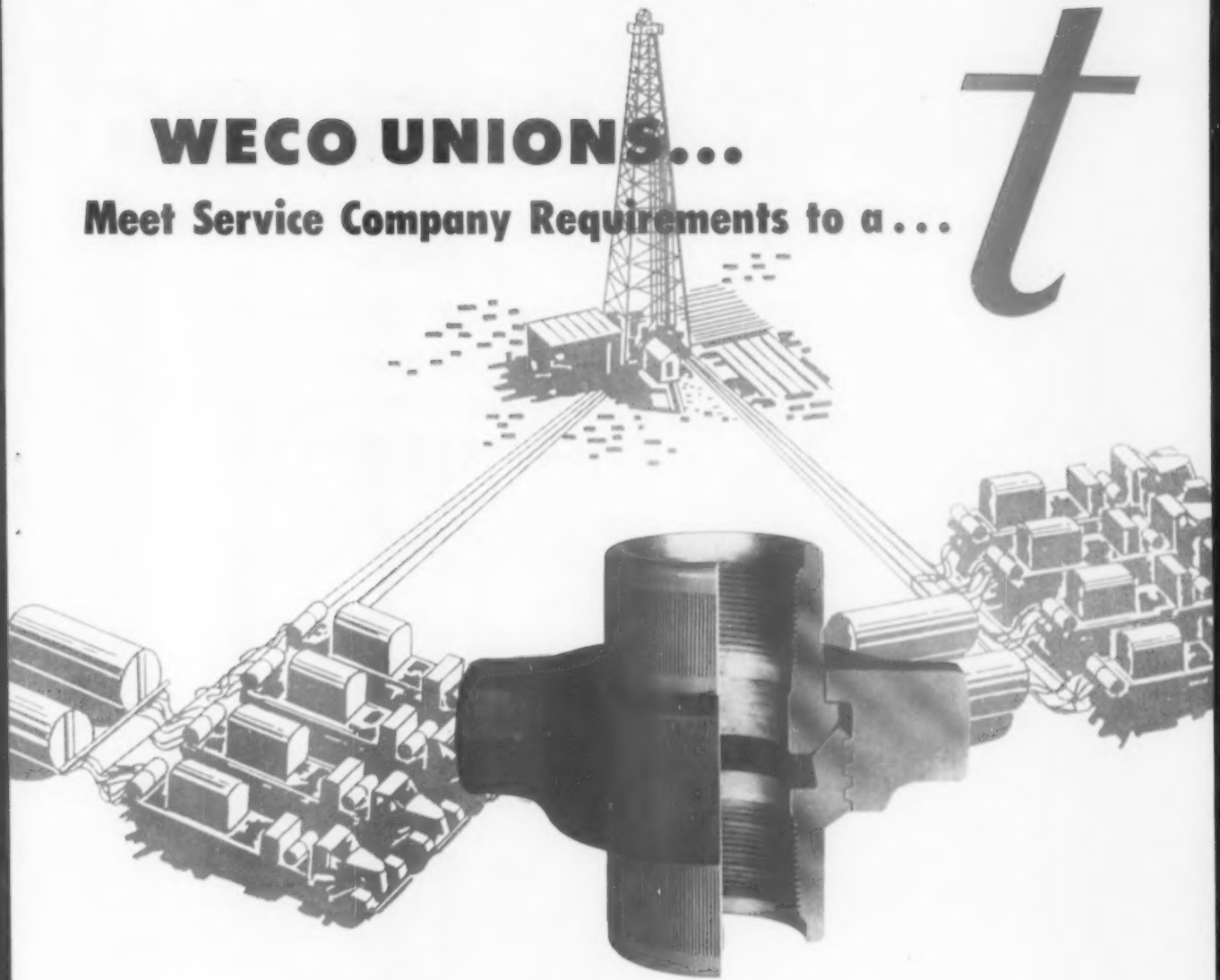
1111 West Perry Street
Bloomington, Illinois

Joe Bestos says:

UNARCO makes more high-temperature pipe insulation than anyone else!

WECO UNIONS...

Meet Service Company Requirements to a... *t*



Fracturing, cementing, and acidizing demand a union that can take it . .

These services require a union that makes-up and breaks-out fast, a union that seals securely on job after job, a union that withstands the severe abrasive action and extremely high pressures and volumes of these operations.

And WECO Unions can take it. Their famous ball and cone seat forms a positive, leak-proof seal . . . their rugged Acme threads make-up and break-out fast . . . their extra tough sub ends and wing nuts take constant abuse—and ask for more—day after day.

• *Because WECO Unions fulfill these demanding requirements so successfully they are used by the majority of service companies.*

U-16-55

WELL EQUIPMENT MFG. CORP.
HOUSTON, TEXAS

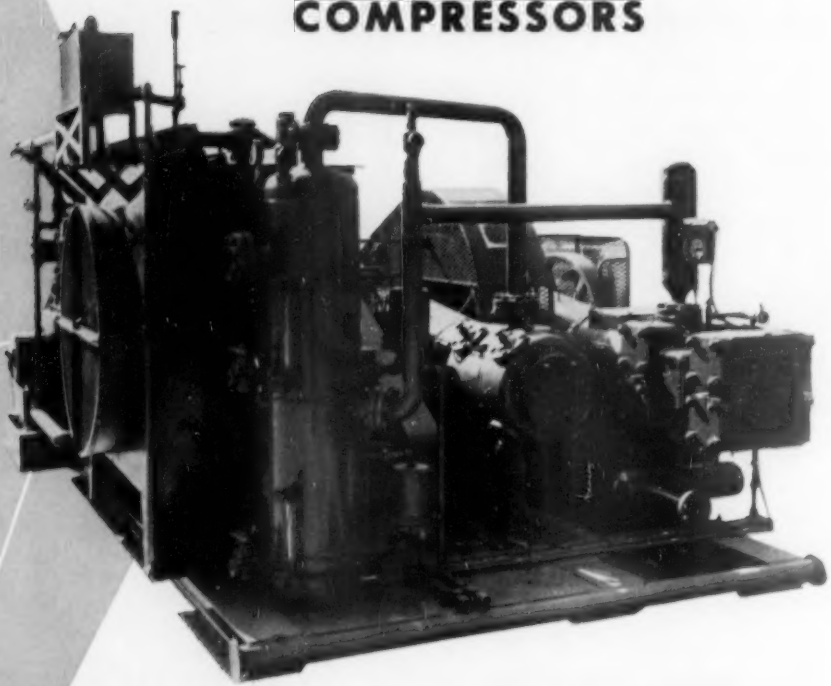
Division of CHIKSAN COMPANY *a subsidiary of*
FOOD MACHINERY AND CHEMICAL CORPORATION

WECO®

* COMPRESSIONEERING

Has made possible the outstanding economical, satisfory and continuous performance of:

WILSON SUPPLY
INGERSOLL-RAND
Packaged, Portable
COMPRESSORS



* The combination of proper engineering with skillful fabrication for every compressor installation.

Compressor Division, P. O. Drawer 19

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Stability,

. . . a basic ingredient in Davison's Petroleum Catalysts

Davison achieves it through control of filament size and orientation (see illustration below). Davison catalysts possess greater mechanical strength because of their larger filament diameters. The orientation of these filaments provides a catalyst of large pore diameters.

These two factors combine to give Davison catalysts longer life through greater stability.

Davison has for many years been the leader in the production of catalysts. This leadership has been maintained through Davison's continuing ability to produce catalysts designed to meet the requirements of all types of fluid catalytic cracking units.

For information on Davison catalysts, see your Davison Representative, or write

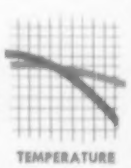
DAVISON CHEMICAL COMPANY
Division of W. R. Grace & Co.
Baltimore 3, Maryland

Sales Offices: Chicago, Ill.; Houston, Tex.; New York, N.Y.; Baltimore, Md.
In Canada: Davison Chemical Company Ltd., Toronto

Producers of: Catalysts, Inorganic Acids, Superphosphates, Triple Superphosphates, Phosphate Rock, Silica Gels and Silicofluorides. Sole Producers of DAVCO® Granulated Fertilizers.

Structural Stability, Catalyst in the form of submicroscopic filaments provides the surface area on which catalytic reactions take place. Large filaments give greater mechanical strength.

Thermal Stability, The graph compares high pore diameter catalysts (in blue) with ordinary catalysts. By resisting heat deactivation, high pore diameter catalysts have a higher useful activity.



For Greatest Reliability over

it's PHILCO POWER

10 times more microwave power gives

EXCLUSIVE WITH PHILCO! Ten times more transmitter power in Philco CLR-7 Microwave systems . . . with a degree of performance and reliability never before attained in microwave equipments.

Heart of the Philco system, the "Power House" Klystron, generates a full watt of power (10,000 watts ERP) in the preferred 6000-7500 mc band.

This Philco CLR-7 Microwave power results in a received signal 10 times stronger—a higher safety margin to overcome adverse propagation conditions.

Philco CLR-7 Microwave equipment can be installed in minimum space . . . employs reliable, long-life tubes, a positive frequency control system and is completely compatible with existing wire line and two-way radio facilities *and with any type multiplex equipment.*

Get complete data on CLR-7 Microwave equipment. Let Philco help in the planning of your system. Philco maintains a staff of microwave specialists who are experienced system and field engineers. Call a Philco field representative or write Philco, Dept. OG, today.

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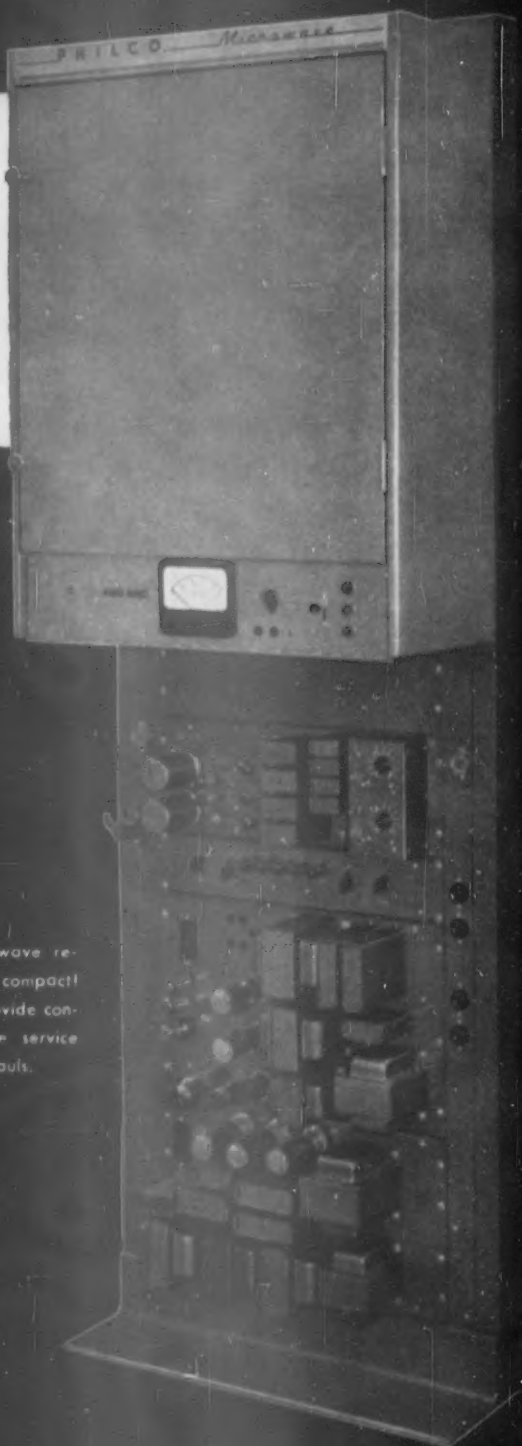
the "Long Haul"

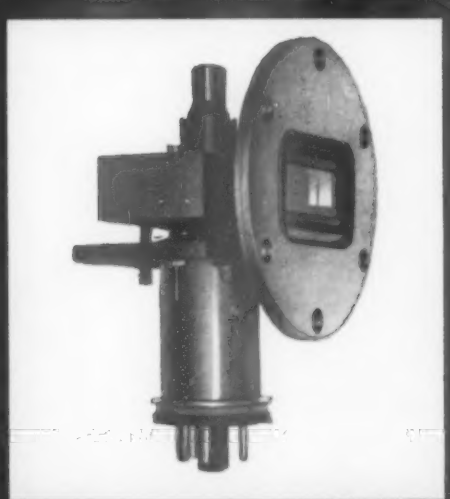
THAT COUNTS!

you advantages like these:

- 160% greater maximum hop distance
- Fewer microwave relay stations
- 10,000 watts effective radiated power—
  50% smaller antennas
- Reduced tower installation costs
- 10 db additional signal safety margin



Philco CLR-7 Microwave repeater . . . rugged! compact! reliable! Built to provide continuous, trouble free service over short or long hauls.



Philco "Power House" Klystron provides the highest equipment power output available in the preferred 6000-7500 megacycle band.

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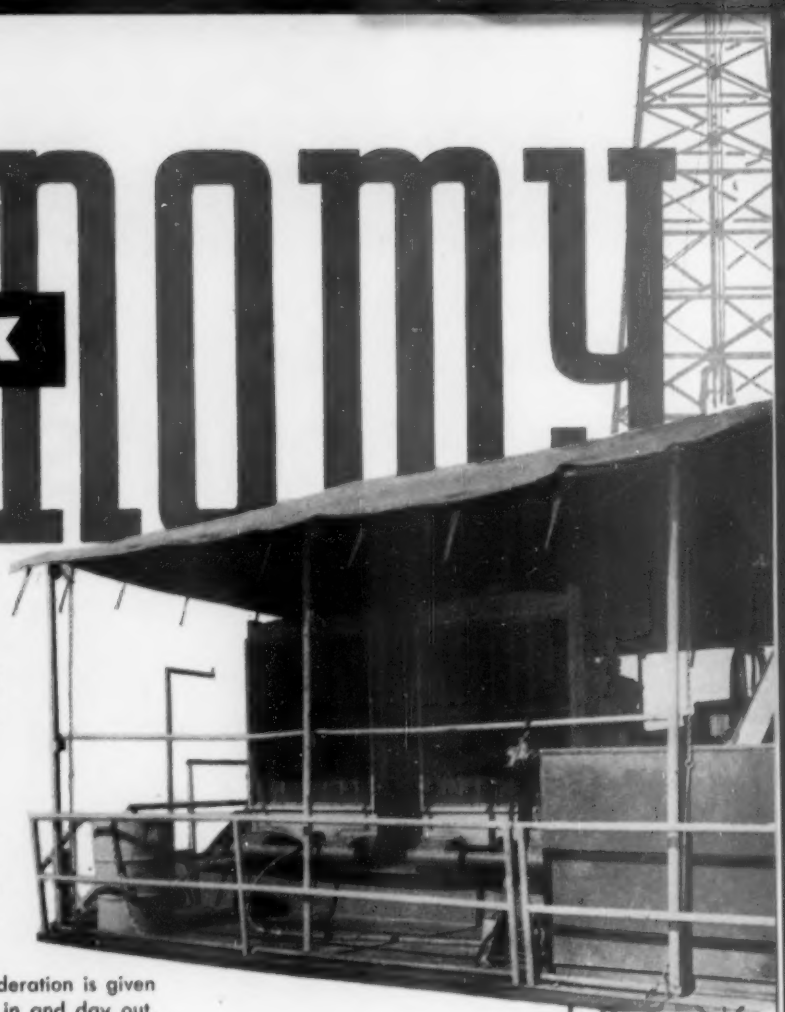
ECONOMY

CLIMAX



IN TEXAS

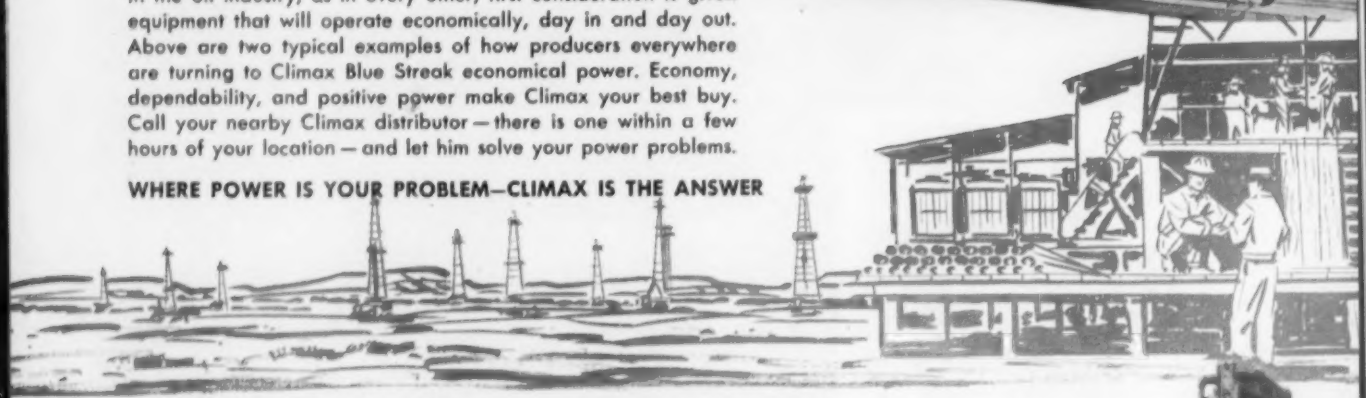
Davidson Drilling Company has used Climax Blue Streak Engines for years. They know, and have proved, that for positive, reliable power Climax is the answer.

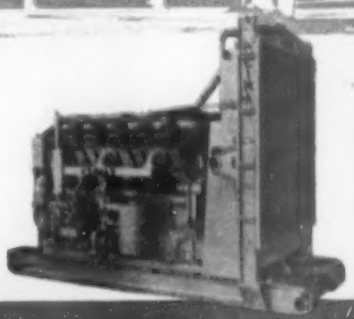
IN LOUISIANA

Grey Wolf Drilling Company depends on Climax Blue Streaks for steady, reliable power. They know from experience that they can count on Climax's instant throttle response, fast acceleration and heavy duty performance.

In the oil industry, as in every other, first consideration is given equipment that will operate economically, day in and day out. Above are two typical examples of how producers everywhere are turning to Climax Blue Streak economical power. Economy, dependability, and positive power make Climax your best buy. Call your nearby Climax distributor — there is one within a few hours of your location — and let him solve your power problems.

WHERE POWER IS YOUR PROBLEM—CLIMAX IS THE ANSWER





climax BLUE STREAK ENGINES

CLIMAX ENGINE AND PUMP MFG. CO.

208 SO. LA SALLE ST. CHICAGO 4, ILL.

FACTORY
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Tobin Machinery Co.
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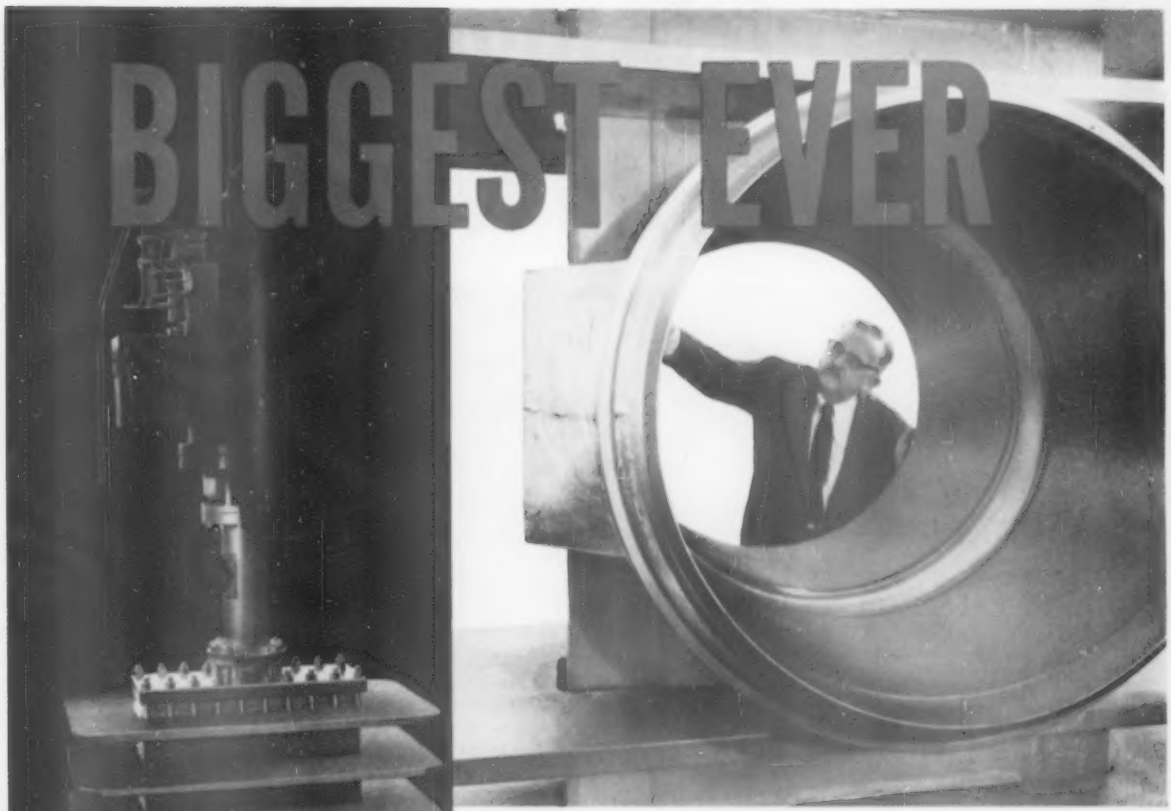


34" full opening high pressure gas line valve—biggest ever built

This Grove Seal-O-Ring Gate Valve with the rugged fabricated steel body design is actuated by a hydraulic piston operating on pressure from the line.

THE WHOLE VALVE IS RIGHT HERE

When valve is full open or closed, bubble-tight seals on both sides of the gate completely isolate line pressure in the conduit. The body, serving merely as framework for operating mechanism and to prevent loss of product while gate is in motion, may be drained or vented to atmosphere when gate is open or closed. Integrity of seals can be checked any time by a tell-tale valve on the body.

602

GROVE SEAL-"O"-RING Gate Valves

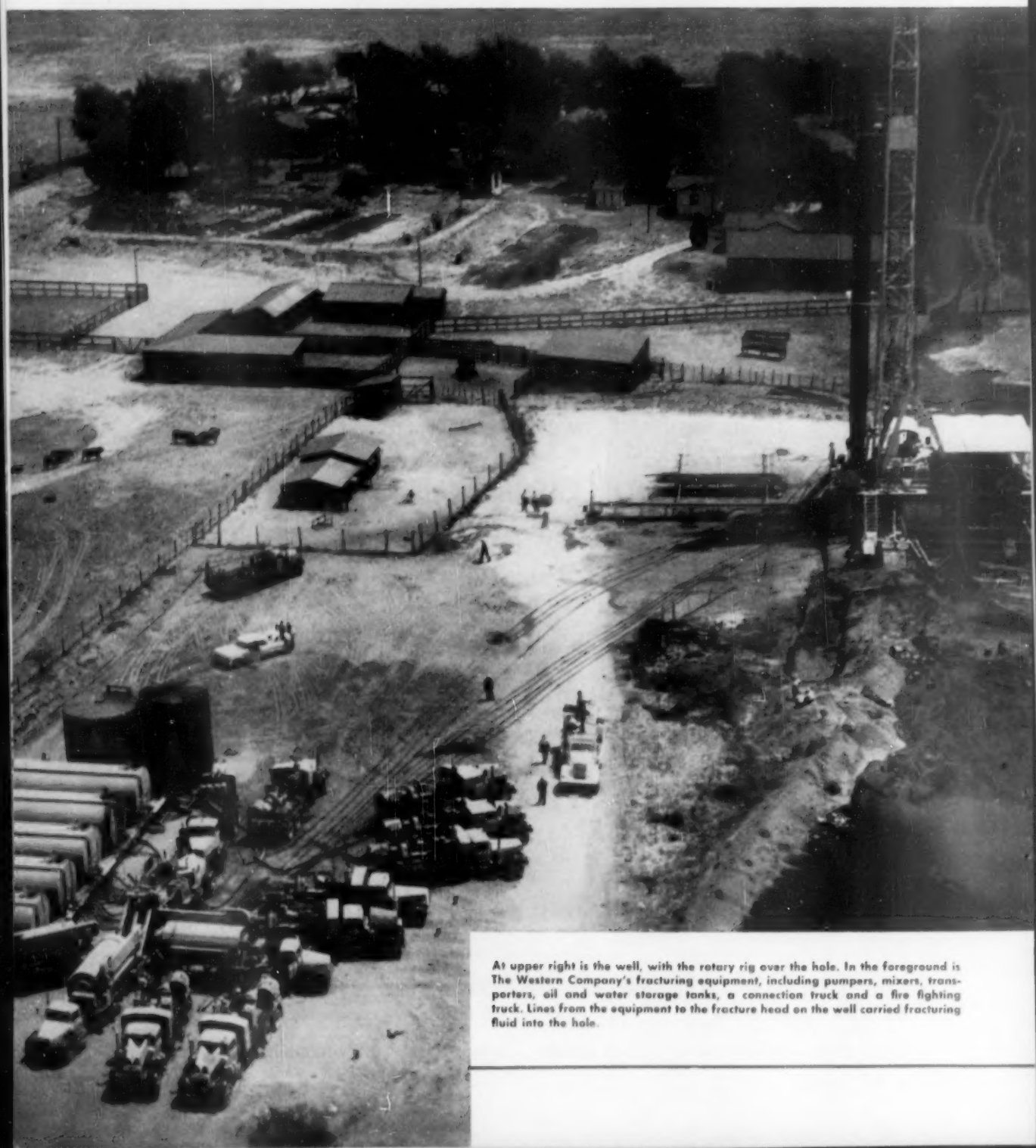
GROVE VALVE and REGULATOR COMPANY • 65th & Hollis Sts., Oakland 8, California
HOUSTON 4 — 1901 Calumet St. • • • • • • • • LOS ANGELES 6 — 1930 W. Olympic Blvd.

ODESSA, TEXAS • TULSA, OKLAHOMA • DENVER, COLORADO • In Western Canada: GROVE VALVE LIMITED

GROVE SEAL RING
GROVE SIMPLICITY ACCURACY SAFETY

"Frac" job brings in Headlee

13,500 feet of NATIONAL



At upper right is the well, with the rotary rig over the hole. In the foreground is The Western Company's fracturing equipment, including pumpers, mixers, transporters, oil and water storage tanks, a connection truck and a fire fighting truck. Lines from the equipment to the fracture head on the well carried fracturing fluid into the hole.

Field Well as good producer

SEAMLESS CASING used

WHEN Southland Royalty Company's Roy Parks, Jr. No. 3, located in the Headlee Field of Midland County, refused to produce, Southland called in The Western Company, of Midland, to fracture the formation. Over a million dollars worth of surface equipment was assembled at the site to gain the desired injection rate in the deep well.

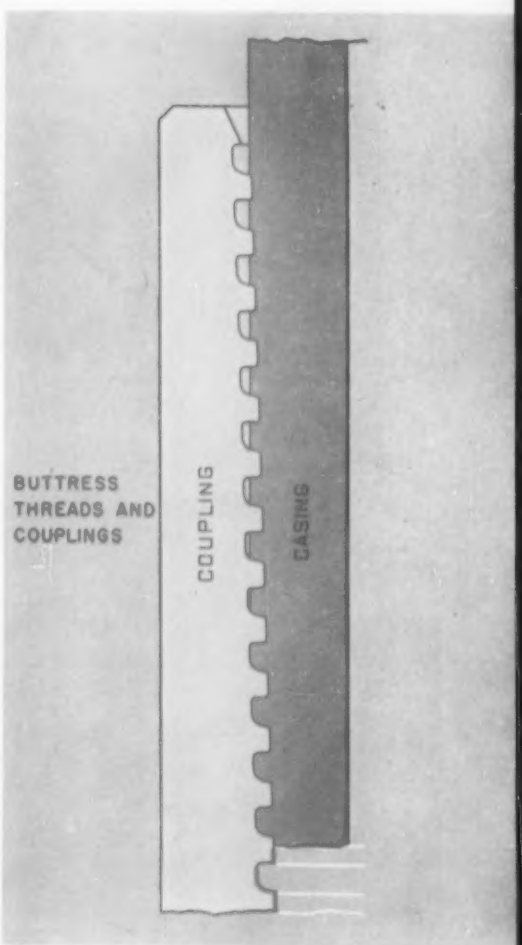
The well had been drilled to the Devonian, and NATIONAL *Deep-Well* and Buttress-Thread Casing had been run and perforated from 11,650 to 11,700 feet. Yet the well had made no commercial show of oil. The fracture treatment made the difference.

First, formation was broken down with crude oil at a pressure of 4800 pounds p.s.i. Then, 10,000 gallons of green oil, containing one pound of sand for each gallon, were pumped into the hole, followed by 290 barrels of flush oil. This stage of the treatment took just 19 minutes at an injection rate of 27.8 barrels per minute. Treating pressures averaged 5800 pounds p.s.i. Following stage one, an additional 38,000 gallons of oil and 18,000 pounds of sand were forced into the formation at a pressure of 6,000 p.s.i. Two days after treatment, the well potentialed 481 barrels of 48 gravity oil through one-fourth inch choke. Tubing pressure was 1700 lbs. and casing pressure was 200 lbs.

NATIONAL Seamless *Deep-Well* and Buttress-Thread Casing were especially developed for just such jobs as this. They possess the high collapse resistance needed to withstand the tremendous vibrations of deep well drilling, and in this instance the terrific stress of a high pressure frac job. The casing joints are designed to bear the weight of unbelievably long strings of casing. No wonder so many successful oil men inevitably say "NATIONAL SEAMLESS."

For full information on National Tube developments in the oil industry, write to National Tube Division, United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pa.

NATIONAL TUBE DIVISION
UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
UNITED STATES STEEL EXPORT COMPANY, NEW YORK



The high tensile strength of the Buttress-Thread joint is due largely to the combined effect of the completely engaged runout threads and the three degree flank angle of the thread which support the weight of the casing in the well. The joint is comparable in strength to the body of the pipe. Buttress-Thread casing eliminates the need for upset-end casing—gives greater inside clearance for the drilling bit, and permits easier, faster coupling to power-tight position.

NATIONAL USS **SEAMLESS**

DRILL PIPE... CASING...TUBING

UNITED STATES STEEL

We Meter Offshore, too!

WHERE service calls are extra-costly, you need equipment which offers maximum dependability and requires minimum service. That's why A. O. Smith Meters are becoming increasingly popular with offshore operators. For complete information, see nearest representative.

Through research A.O. SMITH CORPORATION *...a better way*

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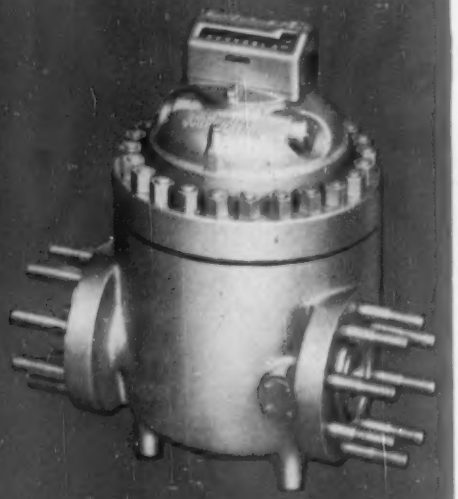
Factories: 5715 Smithway St., Los Angeles 22, Calif. P. O. Box 500, Suceasunna, N.J. *Offices:* Atlanta, Chicago 7, Houston 20, Los Angeles 22, New York 17. *Canada:* Toronto 12, Vancouver 1. *International Division*—Milwaukee 1, Wis.



MODEL K-12 *two-inch meter with horizontal counter. Double-case construction with cast steel outer housing. Rated at 2000 psi. working pressure; Capacity 171 B.P.H., 1500 psi. R.T.J. flanges.*

34 MILES OUT in the Gulf of Mexico, four K-12 Meters are recording condensate production for royalty purposes. Three W-75 Meters on the pipe line measure total production. Constant accuracy is assured and tankage is eliminated.

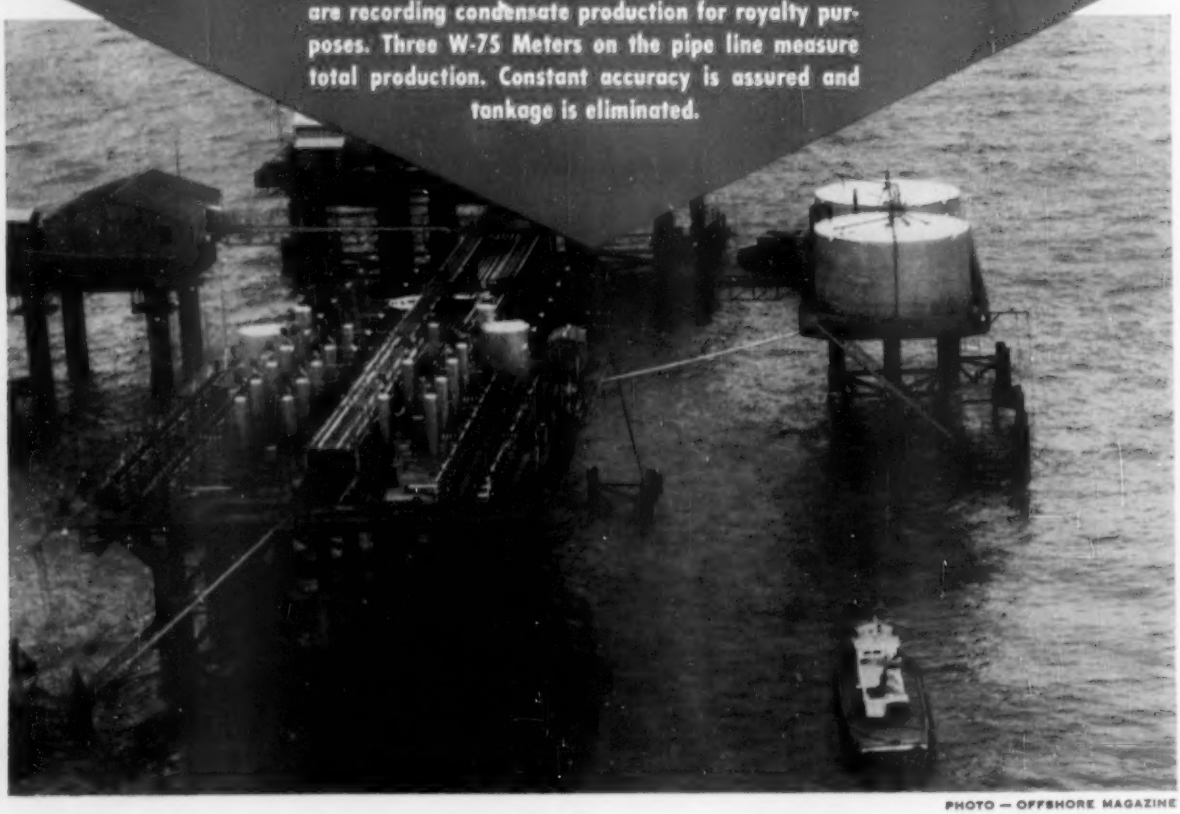


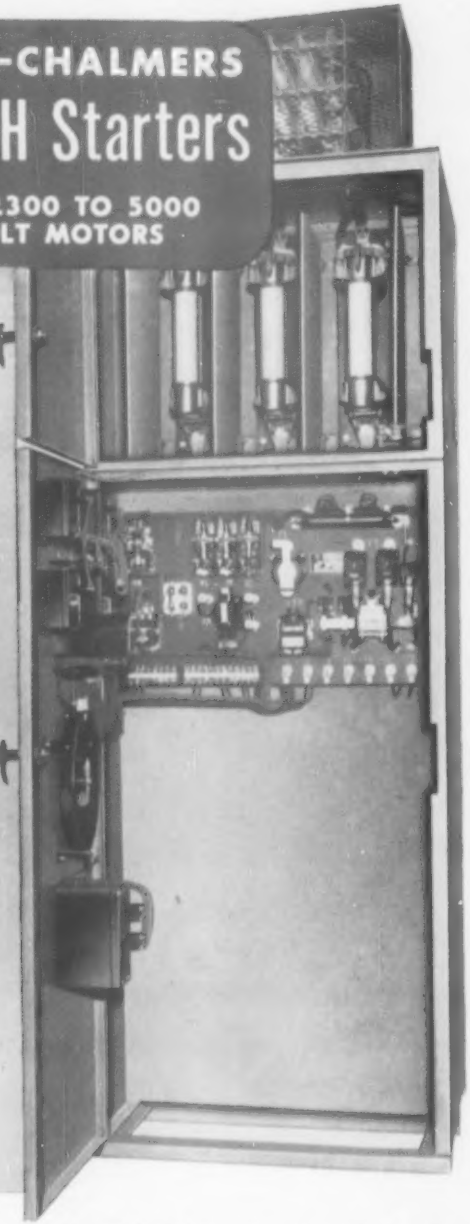
PHOTO — OFFSHORE MAGAZINE

CHOICE of CONTACTORS

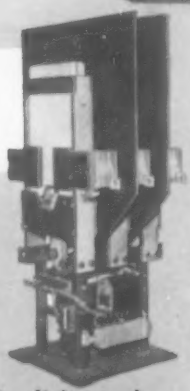
to meet your specific needs

***Allis-Chalmers Type H Starters** may be equipped with either air-break or oil-immersed contactors —installed in the same sized space.*

ALLIS-CHALMERS
Type H Starters
FOR 2300 TO 5000 VOLT MOTORS

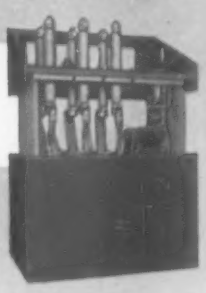


AIR



Designed for top performance on the rough-tough jobs. Advantage of contacts operating in air include long contact life, reduced fire hazard, easy maintenance. Double-break contacts, vertical action and dual blowouts provide long, dependable operation. Design simplicity makes contactor particularly adaptable for applications requiring frequent starting, inching, reversing, or dynamic braking.

OIL



Meets operating demands of semi-hazardous locations. Contactor operates under oil to prevent sparks from igniting atmosphere and to protect mechanism from corrosion. Contactor is time-proved clapper type. Self-cleaning, rolling-wiping action extends contact life. Self-aligning E-type magnet provides perfect armature seating . . . quiet, maintenance-free operation.

YOU GET MORE...

Allis-Chalmers offers help on specific control application problems. Call your Allis-Chalmers representative. His recommendations are backed by Allis-Chalmers engineering departments . . . by the experience gained in solving thousands of control problems . . . by complete research and testing facilities.

For complete information on the Type H starter, write for Bulletin 14B6410B — Allis-Chalmers, General Products Div., Milwaukee 1, Wis.

ALLIS-CHALMERS A-4976

just thinking

Chemical progress is autoclaves, test tubes, distillation towers . . . hydrocarbons, heterocyclic compounds . . . processes, polymerizations, products.

But mostly, chemical progress is thinking . . . *men* thinking. Little men, big men, medium size men . . . in lab coats, business suits, overalls . . . all of them, always, thinking.

Thinking up new products . . . new ways to make chemicals and new ways to use them. Thinking up more comfort, more convenience, better health, for everyone.

Always, the old things have to be improved, and the new things have to be proved. It takes more thinking. The thinking never stops. And so chemical progress never stops.

It's that way at Koppers.

. . .

Koppers Company, Inc., Chemical Division, Pittsburgh 19, Pa., producers of styrene, Dylex styrene butadiene latices, dbpc® antioxidant, resorcinol, potassium cyanide solution, phthalic anhydride, and many other chemicals.*

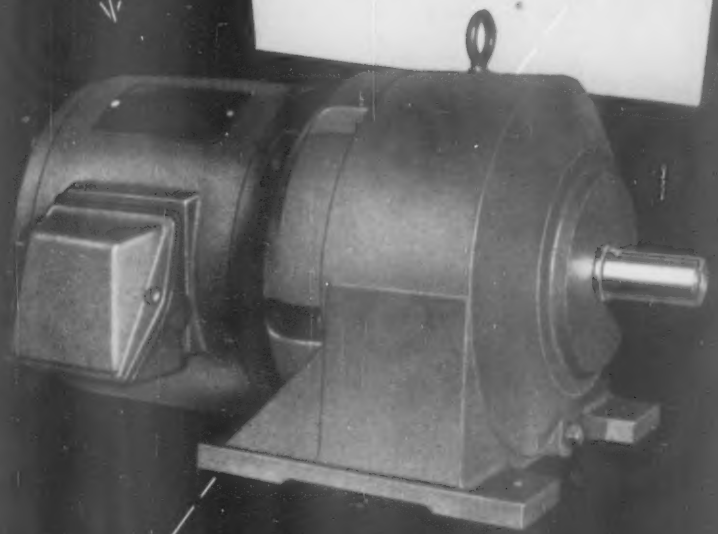
**Koppers Trademark*

Chemical Progress Week, April 23-28

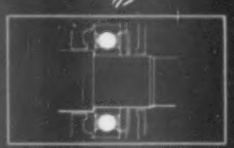
KOPPERS

KOPPERS CHEMICALS

Don't overlook what you can't see



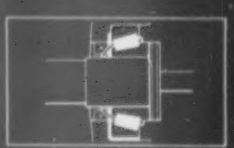
You can't always see what makes a gearmotor outstanding. It's the attention paid to small design details that makes the difference. Here are a few of the details that make the new Reliance Gearmotor stand above the rest.



FOOLPROOF METERMATIC motor bearing lubrication and oil bath gear lubrication for long-life protection against wear.

INDUCTION HARDENING of the tough alloy steel gears gives a perfect combination of wear resistance and strength.

SIMPLIFIED GEARING with few moving parts reduces friction losses and lessens chances of breakdown.



THRUST BEARINGS handle heavy overhung loads safely by placing strain on the frame instead of the shafts.

Find out the complete story for yourself— contact your Reliance representative or write for Bulletin E-2408.

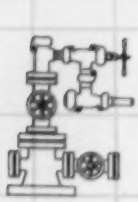
E-2509

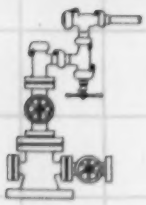
REDUCE SPEED

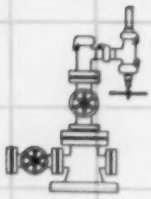
RELIANCE ELECTRIC AND ENGINEERING CO.

CLEVELAND 10, OHIO • OFFICES IN PRINCIPAL CITIES

Canadian Division: Welland, Ontario





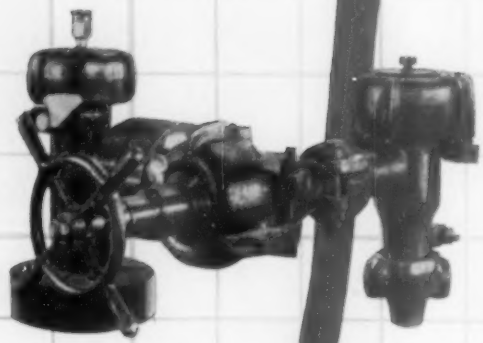


UNIBOLT
flow manifolds

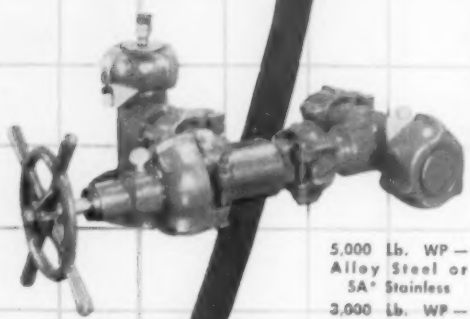
fit your pressures as well as your pocketbook

These are the Christmas tree manifolds that are custom-built to any operator's flow control needs, but at no premium in price. Unlike manifolds of fixed design, UNIBOLT permits complete flexibility in arrangement of its units. Components may have threaded, flanged or UNIBOLT connections. They may be of malleable, regular steel, alloy or SA* stainless, depending upon pressures and service. The chokes may be adjustable or positive with interchangeable flow-rated beans or X-beans. Tee type for single wing or cross type for double wing trees are available. Select exactly what you need for the well. Later on you may salvage the entire manifold as a unit or as individual parts for use elsewhere. By any yardstick, UNIBOLT Flow Manifolds give you far more desirable features . . . at a reasonable cost.

*Special Analysis

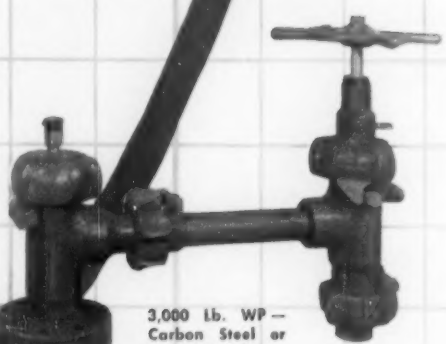


10,000 Lb. WP — Alloy Steel or SA* Stainless



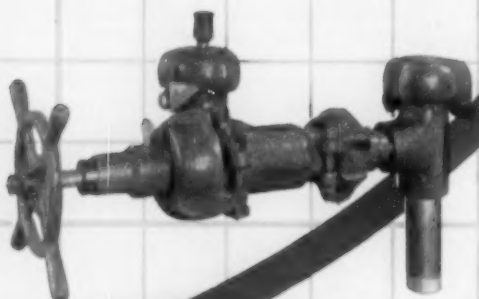
5,000 Lb. WP — Alloy Steel or SA* Stainless

3,000 Lb. WP — Carbon Steel or SA* Stainless



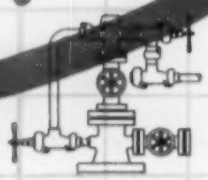
3,000 Lb. WP — Carbon Steel or SA* Stainless

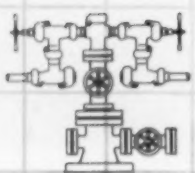
5,000 Lb. WP — Alloy Steel or SA* Stainless

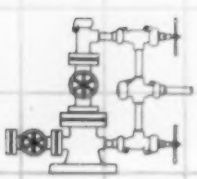


3,000 Lb. WP — Carbon Steel or SA* Stainless

5,000 Lb. WP — Alloy Steel or SA* Stainless

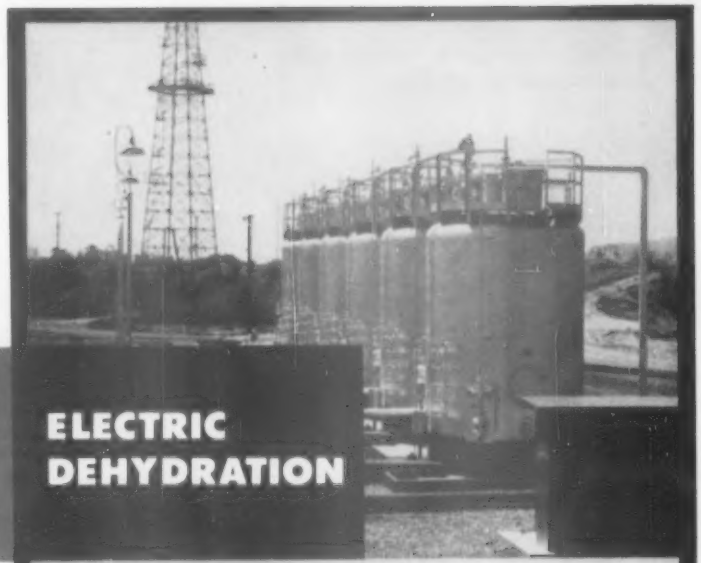






THORNHILL CRAVER CO.
P. O. BOX 1184 HOUSTON, TEXAS

FIRST CHOICE FOR DIFFICULT DEHYDRATION PROBLEMS

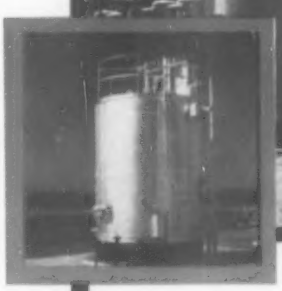


PETRECO

ELECTRIC DEHYDRATION

In both North and South America, Petreco Electric Dehydration is first choice for particularly stubborn dehydration problems. It is highly effective on low gravity oils, and is especially applicable for large central plant dehydrating systems.

One of the greatest advantages of Petreco electric dehydration is its simplicity of operation. It is fully automatic in operation—simply "throw the switch," and you're dehydrating. The Petreco pilot light tells you that your cuts are low, the water is bled off automatically, and the plant is in operation until you "shut her down." For your added convenience, Petreco service engineers are available wherever oil is produced.



PETRECO SEDIMENT SEPARATORS

A new Petreco development which has been very useful to producers using sub-surface hydraulic pumping systems is Petreco Sediment Separation. This method of super-purification removes the entrained moisture, as well as sediment such as sand, silt, rust, etc., from crude oil which is utilized as hydraulic pump power oil.

For complete information on any Petreco process, write or call

SPECIALIZED ELECTRIC PETROLEUM TREATING

Desalting • Dehydrating • Caustic Washing • Acid Contacting • Doctor Treating • Sweetening • Naphthenic Acid Removal • Sediment Removal

PETRECO

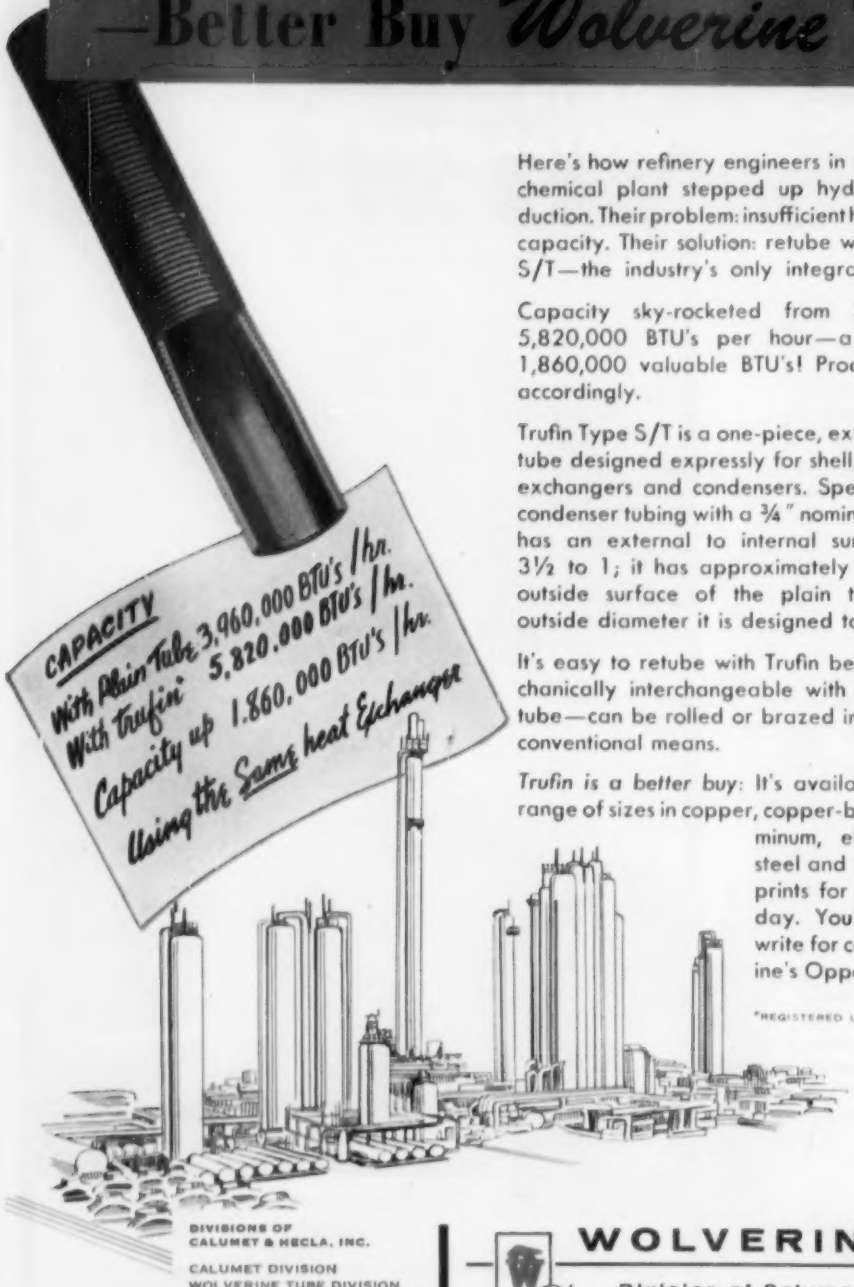
A DIVISION OF PETROLITE CORPORATION
3202 SOUTH WAYSIDE DRIVE HOUSTON 1, TEXAS
1390 EAST BURNETT ST. LONG BEACH 7, CALIF.

DH 6-6

Another opportunity to boost production
—Number 4 of a series.

Better By 1,860,000 BTU'S

—Better Buy *Wolverine Trufin**


CAPACITY
With Plain Tube 3,960,000 BTU's / hr.
With Trufin 5,820,000 BTU's / hr.
Capacity up 1,860,000 BTU's / hr.
Using the Same Heat Exchanger

Here's how refinery engineers in a major petrochemical plant stepped up hydrocarbon production. Their problem: insufficient heat exchanger capacity. Their solution: retube with Trufin Type S/T—the industry's only integral finned tube.

Capacity sky-rocketed from 3,960,000 to 5,820,000 BTU's per hour—a net gain of 1,860,000 valuable BTU's! Production soared accordingly.

Trufin Type S/T is a one-piece, extended surface tube designed expressly for shell and tube heat exchangers and condensers. Specifically, Trufin condenser tubing with a ¾" nominal fin diameter has an external to internal surface ratio of 3½ to 1; it has approximately 2½ times the outside surface of the plain tube with ¾" outside diameter it is designed to replace.

It's easy to retube with Trufin because it is mechanically interchangeable with prime surface tube—can be rolled or brazed into headers by conventional means.

Trufin is a better buy: It's available in a wide range of sizes in copper, copper-base alloys, aluminum, electric-welded steel and bi-metal. Send prints for a quote—today. You'll save! And write for copy of Wolverine's Opportunity Book.

*REGISTERED U. S. PATENT OFFICE

DIVISIONS OF
CALUMET & HECLA, INC.

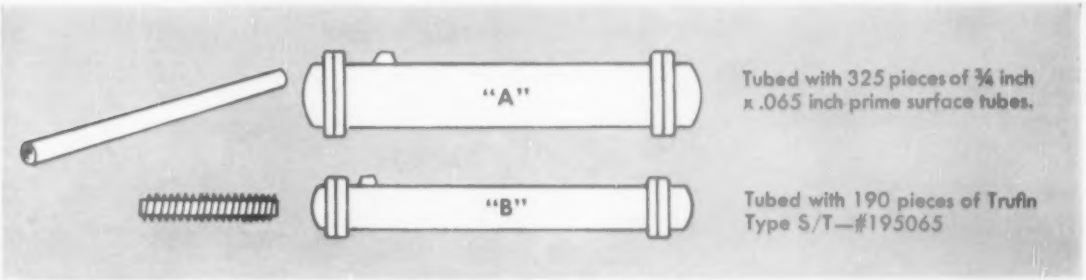
CALUMET DIVISION
WOLVERINE TUBE DIVISION
CANADA VULCANIZER
& EQUIPMENT CO., LTD.
FOREST INDUSTRIES DIVISION
GOODMAN LUMBER CO.

WOLVERINE TUBE

Division of Calumet & Hecla, Inc.

Manufacturers of Quality-Controlled Tubing and Extruded Aluminum Shapes

Let's talk about Condensers



Tubed with 325 pieces of ¾ inch x .065 inch prime surface tubes.

Tubed with 190 pieces of Trufin Type S/T—#195065

Take a look at the sketches of the two shell and tube condensers above. One is substantially larger than the other—*but both handle the same heat load!*

That's important because it represents vital savings in metal—both in the size of the condenser shell and in the number of tubes required.

Additional savings in heat exchanger maintenance, too. After all there are 135 less tubes. Units get back on stream faster!

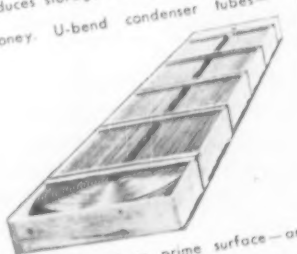
Assuming that Condenser "A" is a four-pass unit and Condenser "B" a two-pass unit, it is interesting to note that "B" (tubed with Trufin Type S/T) has the least tube side pressure drop.

Use of Trufin (all factors such as alloys, water conditions, temperatures and unit design taken into consideration) with an increase in tube side velocity gives a greater boost in heat transfer capacities. This provides the equivalent of additional equipment without additional cost. It adds up to more BTU's per dollar.

Technical discussions on Trufin applications and advantages can be found in Wolverine's Opportunity Book. Write for a copy today! WOLVERINE TUBE, 1449 Central Avenue, Detroit 9, Michigan.

Save Even More!

This new Wolverine idea cuts time, reduces storage problems, and saves money. U-bend condenser tubes—



either finned or prime surface—are arranged in a disposable box-type pallet in the exact order you specify. All you have to do is feed them directly from pallet to unit.

DIVISIONS OF
CALUMET & HECLA, INC.

CALUMET DIVISION
WOLVERINE TUBE DIVISION
CANADA VULCANIZER
& EQUIPMENT CO., LTD.
FOREST INDUSTRIES DIVISION
GOODMAN LUMBER CO.

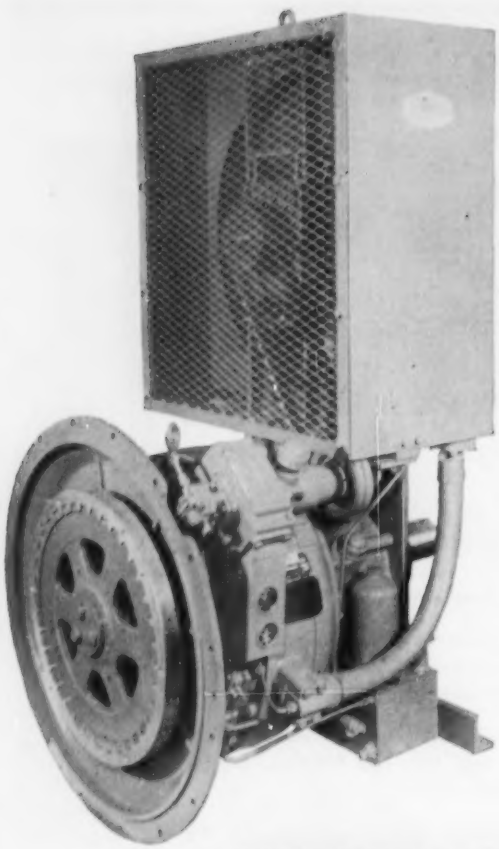
WOLVERINE TUBE

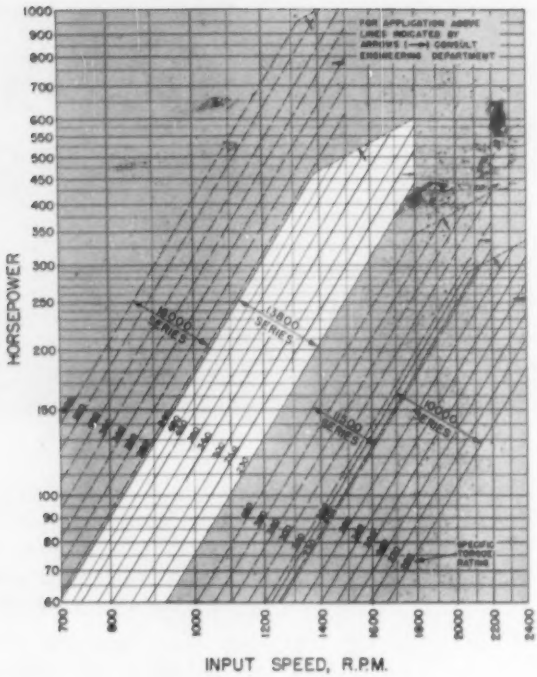
Division of Calumet & Hecla, Inc.

Manufacturers of Quality Controlled Tubing and Extruded Aluminum Shapes

PLANTS IN DETROIT, MICHIGAN, AND DECATUR, ALABAMA. SALES OFFICES IN PRINCIPAL CITIES

EXPORT DEPT., 13 E. 40TH ST., NEW YORK 16, N. Y.





ENGINE APPLICATIONS

Eng. Mfg.—Model	Eng. Mfg.—Model	Eng. Mfg.—Model
Allis-Chalmers PC1875	Climax V-330	Mercedes Benz MB836 BG
Allis-Chalmers DC1875	Climax V-85	MGO V8S
Allis-Chalmers DSC 1875	Cummins LRI	MGO V12
Allis-Chalmers PCS 1875	Cummins NVHS	Murphy J4
Allis-Chalmers PC2505	Cummins VT-12	Murphy J12
Cat D-342	Deutz BA8M517	Murphy J22
Cat D-8	Fairbanks 38F5-1/4	Paxman VAPPHEL
Cat D-364	Gardner 6-L3	Sauer —
Cat D-9	Hall Scott V-12	Sterling V-06
Cat D-375	LeRoi H-1500	Waukesha 140
Cat D-387	LeRoi H-200	Waukesha 145
Climax R-81	M.A.N. 6WV175/122 A	Waukesha 145S
Climax V-285	M.A.N. 6WV175/122 A	Waukesha L90
	Mercedes Benz MB836 B	

ANNOUNCING . . . the new Twin Disc 13,800 Series Three-Stage Torque Converter

By W. B. Gibson, Sales Manager
Hydraulic Division, Twin Disc Clutch Company, Rockford, Illinois

With announcement of the new 13,800 Series, the Twin Disc Clutch Company *now* provides a three-stage torque converter for every horsepower range from 40 to 1,000—offering four distinct sizes, with a total of twenty-nine capacities, through internal blading variations.

Designed specifically to accommodate a large number of engines for which previous models were not ideally suited (see listing above)—this new series is planned around a *simple basic unit*—with easy-to-add components which produce ten specific models. This arrangement permits extreme flexibility and speedy interchange of components to provide a model specifically adapted to a wide variety of applications.

The 13,800 Series provides two *output* arrangements. There is *one standard output shaft assembly* designed for maximum side pull loads up to the full capacity of the converter. On this particular output shaft assembly, an output governor take-off is available. There is also *one standard output flange* designed for universal joint or flexible gear coupling drive.

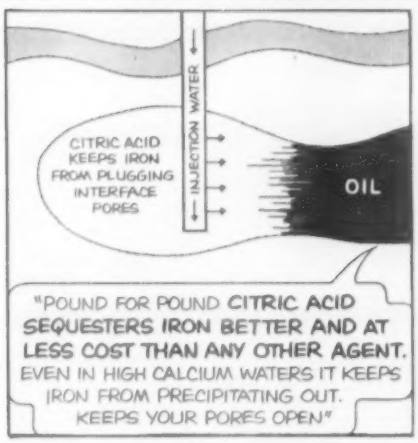
There are also three *input* arrangements—spider drive, incorporating a rubber block drive — which withstands normal misalignment conditions without imposing undue loads or stresses on the input shaft or the engine crankshaft; clutch assembly and independent mounting. In addition to being offered in ten different models, this new torque converter can be adapted, with appropriate engine speeds, to all engines in the 60 to 600 horsepower range by internal blading variations.

Get all the facts on the advantages of torque converter drive in equipment that *you're* planning or designing. Write *now*, to the Hydraulic Division, Rockford, Illinois.

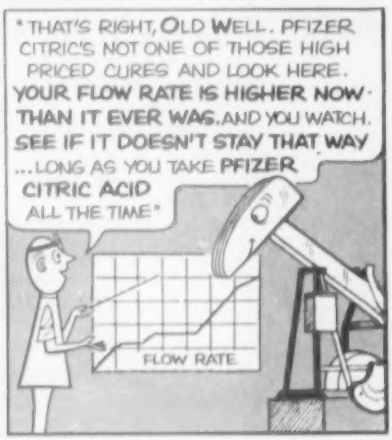
Twin Disc Clutch Company
Racine, Wisconsin
Hydraulic Division, Rockford, Illinois

STOP PLUGGING WITH "PREVENTIVE MEDICINE!"

"OLD WELL, YOU'RE STARTING TO SUFFER FROM A BAD CASE OF PLUGGING AT THE INTERFACE. TOO MUCH IRON-PRECIPITATE! YOUR FLOW RATE'S DOWN"
"GEE, DOC, YOU MEAN I NEED ...ACIDIZING OR EVEN FRACTURING TO LICK THAT IRON PROBLEM? OUCH! THAT'S ROUGH ...AND IT COSTS GOOD MONEY"
"NO, OLD WELL, IT'S NOT THAT SERIOUS. AND IT WON'T BE IF YOU TAKE YOUR MEDICINE — PFIZER CITRIC ACID. THAT'S WHAT YOU NEED. PFIZER CITRIC IN YOUR INJECTION WATER CAN HELP YOU LICK THE IRON DEPOSIT PROBLEM COMPLETELY"

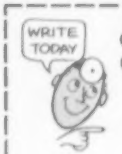

INJECTION WATER
CITRIC ACID KEEPS IRON FROM PLUGGING INTERFACE PORES
OIL
"POUND FOR POUND CITRIC ACID SEQUESTERS IRON BETTER AND AT LESS COST THAN ANY OTHER AGENT. EVEN IN HIGH CALCIUM WATERS IT KEEPS IRON FROM PRECIPITATING OUT. KEEPS YOUR PORES OPEN"

"HEY, YOU IRON DEPOSITS, YOU'VE HAD IT! YOU CAN'T PLUG ME. THIS PFIZER CITRIC ACID REALLY DOES THE TRICK AND LIKE THE DOC SAID — DOESN'T COST MUCH AT ALL!"
HELP!


"THAT'S RIGHT, OLD WELL. PFIZER CITRIC'S NOT ONE OF THOSE HIGH PRICED CURES AND LOOK HERE. YOUR FLOW RATE IS HIGHER NOW THAN IT EVER WAS. AND YOU WATCH. SEE IF IT DOESN'T STAY THAT WAY ...LONG AS YOU TAKE PFIZER CITRIC ACID ALL THE TIME"
FLOW RATE

● As preventive medicine, use Pfizer Citric Acid in your secondary recovery wells. Pfizer supplies citric acid for a multitude of industrial uses throughout the world. This broad distribution pattern assures you of receiving all the citric acid you need without delay. (Just recently, Pfizer has opened a new warehouse in Dallas to serve the Southwest.)

Send the coupon for further information on preventing injection-well plugging with Pfizer Citric Acid.



CHAS. PFIZER & CO., INC. Chemical Sales Division
630 Flushing Ave., Brooklyn 6, N. Y.

Please send me further information on preventing injection-well plugging with Pfizer Citric Acid.

Name _____

Title _____

Company _____

Street _____

City _____ **Zone** _____ **State** _____

Manufacturing Chemists for Over 100 Years **Pfizer**

TREAT YOUR INJECTION WATER WITH PFIZER CITRIC ACID

Branch Offices: Chicago, Illinois; San Francisco, California; Vernon, California; Atlanta, Georgia; Dallas, Texas

PLOWS AND PRODUCTION

Agriculture began to make real progress when the steel plow replaced earlier devices. The modern version of the plow has made ours the best fed nation on earth.

The advent and evolution of the individual pumping units for oil wells is another typical example of American ingenuity.

Leading in this latter field of progress is the CABOT PUMPING UNIT. The patented rubber bearing between the pitmans and the walking beam requires no lubrication, absorbs vibration, and smooths off the peaks of the polish rod load. The cranks are adjustable in a few minutes by one man.

CABOT AC Series structure capacities are from 7,000 to 32,000 pounds maximum polish rod load. The flood lubricated Sykes-cut herringbone gears are rated (API) from 40,000 to 456,000 inch-pounds.

Jones & Laughlin

STEEL CORPORATION

SUPPLY DIVISION – Tulsa

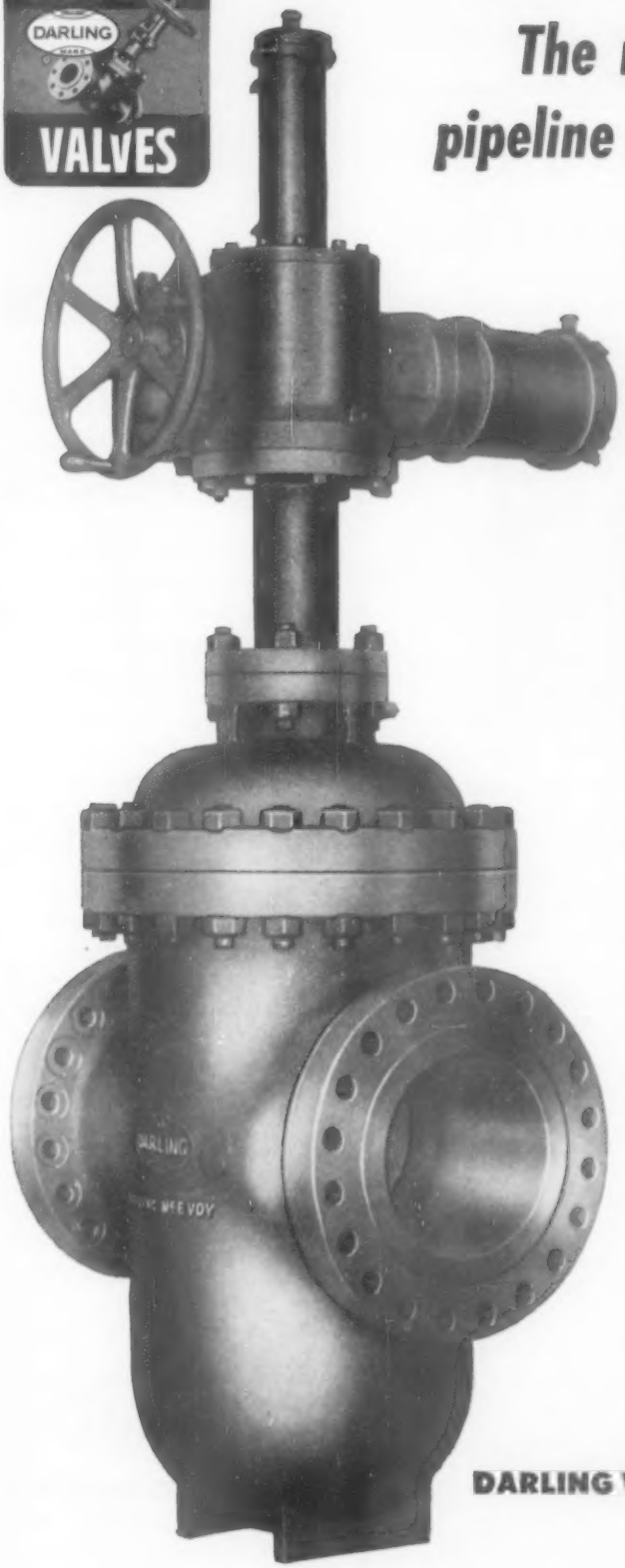
SERVING THE UNITED STATES AND CANADA

J&L STEEL

128-M

DARLING VALVES

The most important pipeline valve development in years



TRADE DARLING MARK McEvoy

New self-sealing two-way conduit valve for pipeline service automatically injects sealant by means of existing line pressure

Here's a new type of conduit gate valve, available in 8-inch and larger sizes, that gives positive downstream closure without dependence on metal-to-metal contact. Each time the valve closes, the required amount of sealant is applied automatically.

How it works

Employing the time-tested McEvoy principle, two cylinders, filled with special sealant, are located within the valve. Both are operated by line pressure. Depending on the direction of flow, line pressure actuates one or the other of these cylinders to force sealant into a channel in the downstream face of the seat. Since these cylinders hold enough sealant for 50 or more closures, the valves need only periodic servicing for recharging with sealant.

Write for details

Ask for bulletin #5402 which contains complete information on the design and operation of this valve.

DARLING VALVE & MANUFACTURING CO.
Williamsport 1, Pa.

Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ontario

Pumping Progress Report

FOR PETROLEUM ENGINEERS

An advertisement prepared by the Aldrich Pump Co., Member of Hydraulic Institute, U.S.A.

SPACE, in many pump installations, is a major problem. Another is the necessity for special foundations. When new installations are considered, these factors may dictate more elaborate construction than should be necessary. And for replacement or modifications of existing systems, they may require expensive piping and equipment changes.

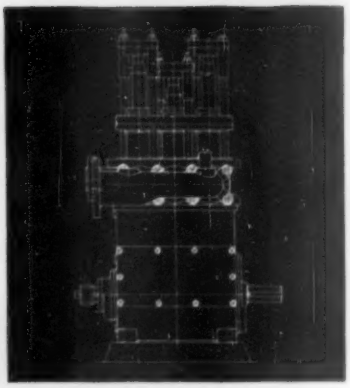
COMPACTNESS OF DESIGN, while often desirable, is not necessarily the answer. Simplicity of design — as in the case of ALDRICH Direct Flow Pumps — may be a better solution.

SIMPLICITY OF DESIGN brought about the first inverted Triplex and Quintuplex Pumps and ultimately Septuplex and Nonuplex Pumps. This Aldrich design innovation brought to pump users many economies of space, maintenance and operation they had never known.

INVERTED PUMP DESIGN permits the use of less expensive foundations. With the crankshaft located near the floor there is no need for expensive foundation work to raise the driver or lower the pump. Then, too, inverted pumps require fewer square feet of floor space than conventional pumps.

MAINTENANCE COSTS ARE REDUCED. Fluid-end, where most work is done, is at chest level. Bearing replacements are made without removing heavy crankshafts or connecting rods. Crossheads on all Direct Flow Pumps can be worked on or removed from pump without disturbing fluid-end.

TELL US ABOUT YOUR PUMPING PROBLEM. The chances are that one of our standard pumps — or a modification of one — will do your job. Detail your problem and we'll send you a copy of the Data Sheet that describes the Direct Flow Pump we recommend. Write to: The Aldrich Pump Company, 9 Gordon Street, Allentown, Pa.



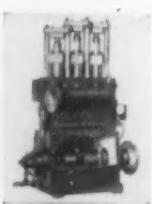
Aldrich inverted vertical pump design

...for your tough pumping problems specify ALDRICH

The entire line of Aldrich Direct Flow Pumps feature two outstanding design innovations—inverted vertical design and sectionalized fluid-ends. These two features have helped make Aldrich the organization hydraulic engineers turn to when they face tough pumping problems. If you have a pumping problem, turn it over to the men who have never turned down a challenge.

CHECK THESE ADVANTAGES OF INVERTED PUMP DESIGN:

Smaller Foundations
Simpler connection with prime mover
Less floor space required
Reduced maintenance costs



Write today for Data Sheets describing the Direct Flow Pump Series.

THE ALDRICH PUMP COMPANY

Originators of the Direct Flow Pump
9 GORDON STREET
ALLENTOWN, PA.
Representatives in principal cities

They Say—

That $2,500 Offer

"Not having been born yesterday, we resent being treated as an infant, and one not quite bright at that.

"We are no longer impressed, for instance, by office-holders and candidates who beat their breasts and shout that their 'vote is not for sale.' In our 70 years we have observed that self-proclaimed honesty shouted from the housetops is not positive proof of integrity. In fact, we are inclined to look upon such office-holders and candidates with just a touch of suspicion.

"We are not impressed by a senator—in this instance Senator Francis Case—who turns down a $2,500 campaign contribution made by about the clumsiest campaign contributor in the long history of campaign contributions. Any candidate who made himself a party to such a thumby enterprise would be more than stupid.

"We are not moved by the fairness and discernment of Senator Case in refusing to brand the gift as a 'bribe' . . .

"Nor are we impressed by the rejection of a campaign contribution that was once tentatively accepted.

"Nor are we awed by the intelligence of a senator who must wait a week to discover the profession of a man who gave him $2,500 . . .

"Nor are we moved to anything but slightly lifted eyebrows by the memory of a senator whose tediously windy testimony would indicate total recall of every detail of his life back to the cradle, and yet, who failed to remember a letter received and answered a few weeks previously which explained who and why the contributor was long before he made his contribution.

"Nor are we impressed by a great hue and cry against campaign contributions by a candidate who has three lieutenants combing the countryside for campaign contributions to a primary election in which there is no opposition.

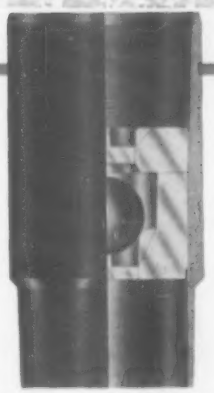
"Nor are we swayed by shouts of 'abnormal interest' against a $2,500 campaign contribution by a man who has run repeatedly without protest on a ticket financed in considerable part by numerous out-of-state contributions of much larger amounts.

"Nor are we convinced of the logic of voting against a bill solely because one of its proponents made a clumsy attempt at a campaign contribution . . .

"Nor are we grateful to the Senator for insulting a legitimate industry to

RECTOR

ALL METAL Casing Shoes and Collars give you THREE Important NEW Advantages!



TYPE "A" FLOAT COLLAR

TYPE "A" FLOAT SHOE

1. GREATER STRENGTH: Aluminum alloy internal parts have far greater impact, compression, tensile and shear strength than cement or bakelite.

2. PRECISION CEMENTING: Being all metal, they can be precision machined and ground to close tolerances for precision performance.

3. RAPID DRILLABILITY: Because of its superior strength, less aluminum alloy is required. It not only drills out faster but there is less material to drill out.

• These new Rector Type "A" cementing shoes and collars have internal parts of a special aluminum alloy that combines strength, abrasion resistance and drillability. The bodies are precision machined from high quality seamless steel—internal aluminum alloy parts are machined and ground to close tolerances.

Available in all standard sizes and standard threads FROM YOUR SUPPLY STORE.

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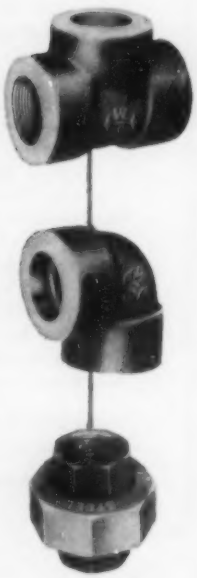


■ W-S Forged Steel Fittings provide safe, tight connections for your small diameter, high pressure piping. In gathering lines . . . pump and compressor piping . . . instrument lines and other high pressure lines, 4" and under in diameter, W-S fittings protect you against costly down-time. They're drop-forged for extra strength and toughness—and they're safety-factor designed.

Watson-Stillman Fittings are available in screw-end and socket-welding types in carbon steel, stainless steels and alloy steels. Send for your copies of our informative catalogs.

W-S FITTINGS DIVISION

H. K. PORTER COMPANY, INC.
Roselle, New Jersey

which South Dakota is looking for developmental and risk capital which it so sorely needs . . .

"Nor have we been impressed by President Eisenhower's joining with Senator Case in a holier-than-thou tilt against a campaign contribution windmill.

"We are not excited by charges of 'campaign contributions' hurled by a President who sits atop one of the largest stacks of campaign contributions ever amassed by the Republican party and against an opposition party whose treasury is currently virtually empty . . .

"At 70, this newspaper is resigned to the conviction that neither Congress nor the Administration can end stupidity. But in a world afire, in a nation burdened with taxes, in a land where the basic industry of agriculture is facing bankruptcy, the Congress and the Administration can compound existing stupidity by devoting their time and energy to every sideshow and side issue that comes along."

Editorial Daily Plainsman, Huron, S. D.

Is There a Shortage?

Dear Sir:

Shortage of engineers? The joke of the century! Or as most practicing engineers say: "What shortage?"

The public is being bombarded daily with articles on the engineer shortage and all related topics. Everything from poor secondary school preparation to government policy has been blamed, and many self-styled experts can give a multitude of reasons for this "shortage." But has anyone stopped to ask the average engineer what he thinks?

Most practicing engineers above 30 years old are recommending against engineering as a profession. This seems like a contradictory statement in light of all the current publicity. Why do these men who are in such short supply belittle their chosen profession? The answer is not as complicated as it seems.

During 1949 through 1952 engineers were referred to by some industrial leaders as "bananas," meaning they could be bought by the bunch. Sadly enough they were correct and new graduates during this period started their industrial life working for less pay than they could make digging ditches. During the next 4 years this surplus disappeared because fewer students preferred the difficult courses found in every engineering curriculum. As the pool of available men began to shrink, industry began to cry shortages. What they mean is that there is no surplus.

Today the average company is still looking for the engineer to work for a

22,570 FEET - 350°F - Magcobar was there!

A major factor in drilling the world's deepest well was good mud control and good mud. Magcobar furnished approximately 80% of the drilling mud and chemicals on the LL&E No. 1-L Humble, record breaker drilled by Richardson & Bass, John W. Mecom, and Freeport Sulphur.

Here's what the trade papers have to say about the mud program on the world's deepest well.

Oil & Gas Journal, January 23, 1956:

"Good mud control was an important factor in the well's reaching the record depth . . . Static bottom hole temperature was estimated to be more than 350° F . . . Lime treated muds usually cause trouble by solidifying at this temperature, but this mud stayed in good condition all the way . . ."

Petroleum Week, November 18, 1955:

"The planning that went into this well is also evidenced by the careful handling of the mud . . ."

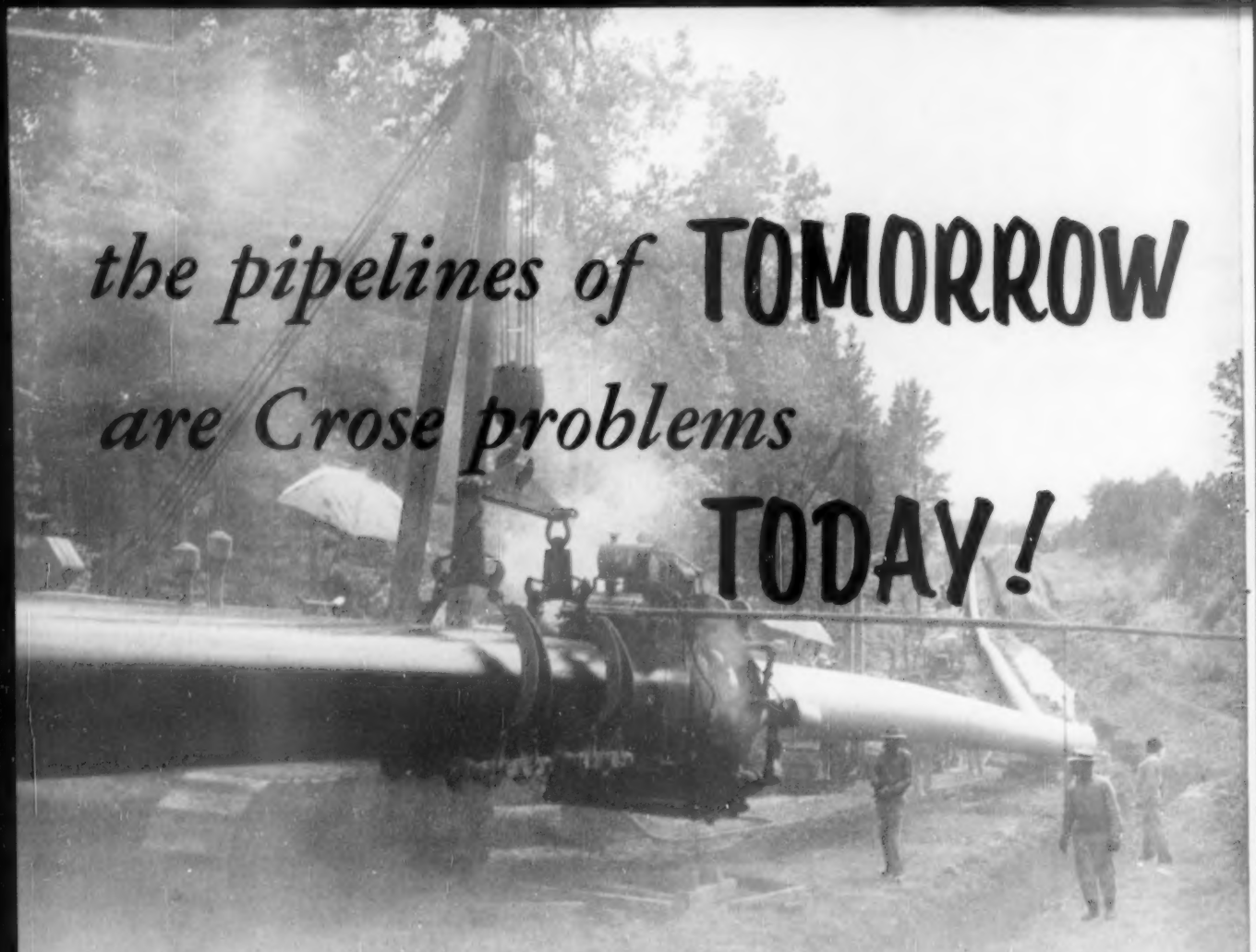
Petroleum Engineer, December, 1955:

"Operators point out that the success achieved can be largely attributed to careful planning and excellent control of the drilling mud . . . Mud control is key to record depth . . . Of considerable interest is the lack of difficulties due to lost circulation, excessive gas cutting and excessive filter cake commonly encountered in South Louisiana. Success in avoiding these difficulties has been attributed to the accurate control of the mud weight and properties."

Magcobar
Complete
DRILLING MUD SERVICE

MAGNET COVE BARIUM CORPORATION

HOUSTON, TEXAS



the pipelines of TOMORROW *are Crose problems* TODAY!

Crose engineering and research is constantly working to develop new and better pipeline construction equipment. The 36" cleaning and priming machines — coating and wrapping machines used on the Transcontinental Gas Pipeline job were the result of Crose engineering and research. The machines, largest of their kind, show the forward thinking of Crose designers. Whatever equipment tomorrow's pipelines will demand — you can bet that Crose will build it.

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fraction of what he is worth. The classified section of the daily papers in Houston are full of ads asking for engineers but upon investigation these companies are still offering an experienced man less than he could obtain as a craftsman.

When the operating companies decide to pay their engineers in line with their duties, the present job hopping will stop. Industry leaders should take stock and realize that a man's attitudes toward his job are determined by the condition of his pocketbook.

O. Van Ratcliff
Consulting Engineer
Houston, Tex.

No Corrosive Effects

Dear Sir:

Under date of March 16, 1951, I wrote to Clarence F. LaMere of the Young Radiator Co. in reply to his inquiry as to the probability of forming corrosive acids in the engine cooling system as a result of using water condensed from exhaust gases.

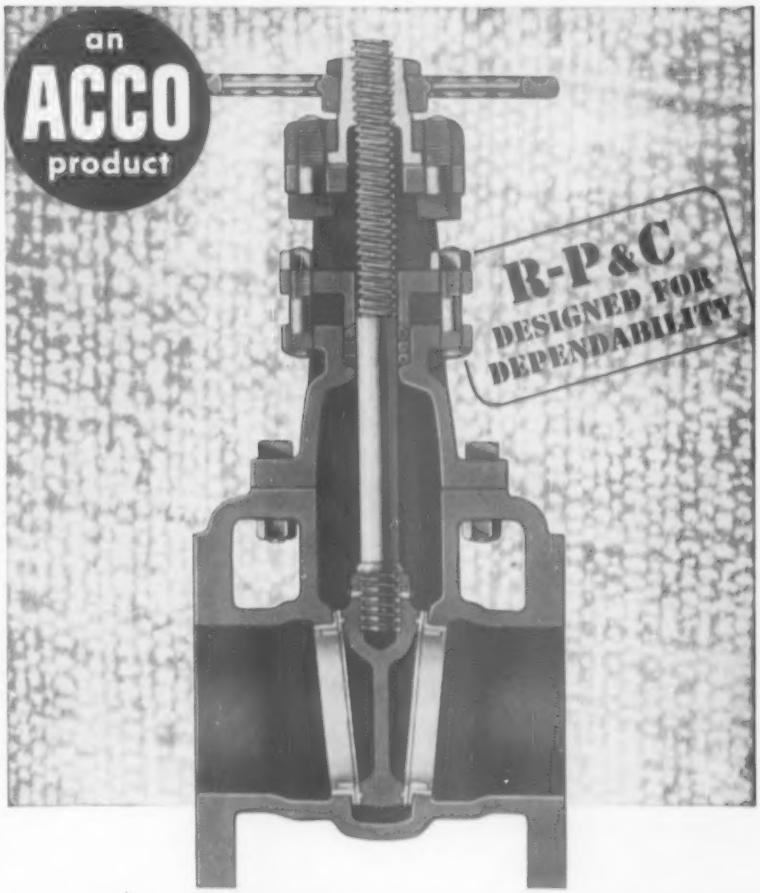
His question of course, was prompted by my article entitled "Cost Cutting Through Better Lubrication" which appeared in the March 12 issue of The Oil and Gas Journal.

My letter said in part:

"As to whether any corrosive effects have been noted; as far as we have been able to ascertain, the reply must be in the negative. Of course we have had the advantage of excellent cooling system maintenance made possible by the use of sodium chromate in solution with the water at all times. In this manner, we are able to hold the pH of the coolant at a fairly steady value between 8.5 and 9.0. The continual liberation of alkali through the gradual reduction of the Na_2CrO_4 is quite adequate to neutralize any organic acids that might possibly be introduced into, or form in the recirculating water system. However, we find there is no evidence to indicate that excessive corrosion would result from using condensed water from the exhaust gasses in an untreated form. Several water analysis reports from other operators using untreated water bear this out.

"As a further step toward the prevention of corrosion in our engine cooling systems, we are now testing the effectiveness of special zinc anodes immersed in the cooling water. It is believed that many of the scale producing salts and other soluble contaminants can be electro-chemically precipitated from the solution by the use of such devices."

Alva G. Smith
Superintendent
Mechanical Department
Mid-Continent Pipe Line Co.
Tulsa, Okla.



Wedge Gates from 2" to 24"

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• Thousands of these **Fig. 625** iron body wedge gate valves, in hundreds of different services, are giving the dependable economical service which has come to be synonymous with R-P&C. Rated for 125 lbs. Steam—200 lbs. OWG in sizes up to 12", and for slightly lower pressures in larger sizes, they are regularly furnished with bronze trim for use with steam, water, oil or gas. Also provided in all-iron for use with fluids which attack bronze.

• Their record for dependable service and low maintenance requirements is shared by R-P&C's complete line of iron body valves—gates, globes, angles, checks and cocks in a complete range of sizes, body styles and pressure classes up to 250 lbs. All are made from castings of special fine-grained, high test, cast iron —50% stronger than ordinary cast iron. Precision manufacturing and step-by-step quality control result in tight closures, easy operation and longer wear.

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ACCO

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AMERICAN CHAIN & CABLE

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R-P&C valves

CALENDAR OF EVENTS

APRIL

24-25 Pacific Coast Gas Association, Supply and transmission conference, Thunderbird Hotel, Las Vegas, Nev.

25-27 American Petroleum Institute, Division of Production, Eastern District meeting, Deshler-Hilton Hotel, Columbus, Ohio.

25-29 World Oil Exposition, Houston.

26 Panhandle Producers and Royalty Owners Association, annual meeting, Herring Hotel, Amarillo.

26-27 Eleventh Annual Management Engineering Conference, sponsored jointly by Society for Advancement of Management and management division, American Society of Mechanical Engineers, Hotel Statler, New York.

26-27 Rocky Mountain Oil and Gas Association, refining committee, ninth annual meeting, Newhouse Hotel, Salt Lake City.

29-May 1 Pennsylvania Petroleum Association, annual meeting, Bedford Springs Hotel, Bedford Springs, Pa.

30-May 1 Independent Petroleum Association of America, semiannual meeting, Statler Hotel, Los Angeles.

30-May 2 American Geophysical Union, thirty-seventh annual meeting, Washington.

30-May 5 International Course on Atomic Energy, sponsored by National Industrial Conference Board, Westchester Country Club, New York.

MAY

1-3 Petroleum Industry Electrical Association, annual meeting, Statler-Hilton Hotel, Dallas.

6-9 American Institute of Chemical Engineers, Roosevelt Hotel, New Orleans.

7-8 Gas Compressors Institute session, sponsored by University of Kansas and Southwest Kansas petroleum industry, Liberal, Kans.

7-11 American Welding Society, annual spring meeting, Hotel Statler, Buffalo.

9-10 Symposium on control of corrosion in the chemical industry, University of Buffalo.

9-10 National Association of Corrosion Engineers, Niagara frontier section, symposium on control of corrosion in the chemical industry, University of Buffalo.

9-11 Canadian Institute of Mining & Metallurgy, Petroleum and Natural Gas division, seventh annual technical meeting, Palliser Hotel, Calgary.

10-11 American Petroleum Institute, Division of Production, Pacific Coast district meeting, Statler Hotel, Los Angeles.

10-11 American Gas Association, Gas Supply, Transmission, and Storage Conference, Conrad Hilton Hotel, Chicago.

13-15 Empire State Petroleum Association, Statler Hotel, Buffalo.

13-16 American Petroleum Institute, annual pipeline conference, Shamrock Hilton Hotel, Houston.

14-15 American Institute of Mining, Metallurgical & Petroleum Engineers, Kansas regional meeting, Broadview Hotel, Wichita.

14-16 American Petroleum Institute, annual pipeline conference, Shamrock Hotel, Houston.

14-16 Petroleum Electric Power Association, eighth annual convention, Robert Driscoll Hotel, Corpus Christi.

14-17 American Petroleum Institute, Division of Refining, midyear meeting, Montreal.

16-18 American Gas Association, Chemical, Engineering, and Manufactured Gas Production Conference, Benjamin Franklin Hotel, Philadelphia.

17-18 Rocky Mountain Petroleum Sections, American Institute of Mining, Metallurgical & Petroleum Engineers, Gladstone Hotel, Casper, Wyo.

22-24 Pennsylvania Gas Association, Pocono Manor Inn, Pocono Manor, Pa.

24-25 Natural Gas and Petroleum Association of Canada, Sheraton Brock Hotel, Niagara Falls, Ont.

24-25 Western Petroleum Refiners Association, Michigan Regional Meeting, (location to be announced).

24-25 Kentucky Oil and Gas Association, annual meeting, Lafayette Hotel, Lexington, Ky.

28-30 Chemical Institute of Canada, 39th annual conference and exhibition, Sheraton-Mount Royal Hotel, Montreal.

30-June 1 Texas College of Arts & Industries, eleventh annual short course in Gas Technology, Kingsville, Tex.

30-June 2 Interstate Oil Compact Commission, Dallas.

JUNE

3-8 Society of Automotive Engineers, summer meeting, Chalfonte Haddon Hotel, Altantic City, N. J.

6-8 American Society for Quality Control,

More shut-offs per dollar!

Globe or gate, solder cup or threaded . . . you get extra value with NIBCO pressure rated valves. That's because their Nibcoloy stems permit the cutting of accurate long-wearing threads, are high in tensile strength, and are non-corrosive. Then, too, valve bodies are 85-5-5-5 alloy in accordance with A.S.A. standards. In fact, NIBCO valves meet or exceed all performance standards . . . with SWP and WOG pressures clearly marked on side of the body. And they're made by valve specialists — in a plant devoted exclusively to the manufacture of valves.

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Northern Indiana Brass Co.,
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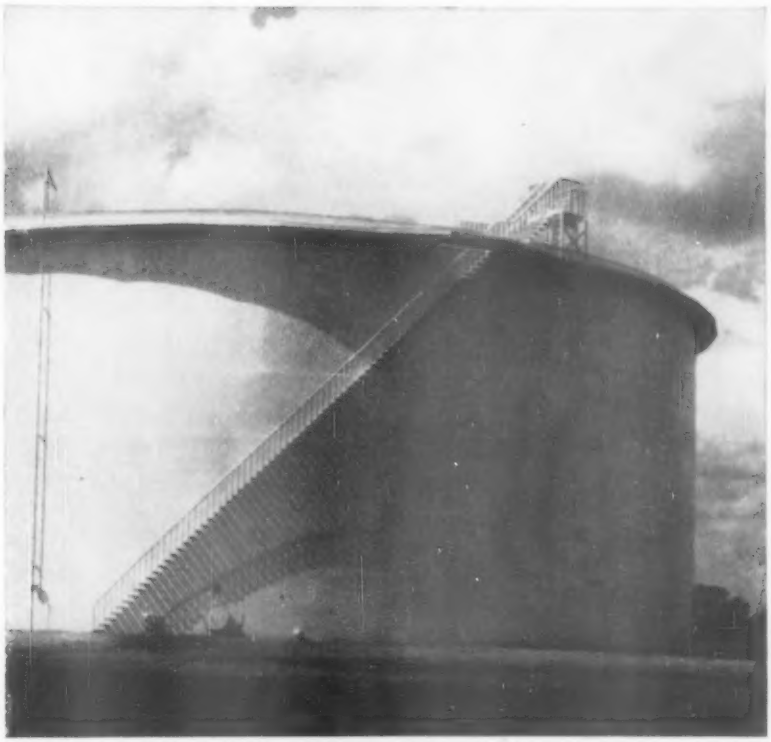


The Sinclair Pipe Line Company and Rockwood have developed a new integrated fire protection system that is actually built into this Sinclair Pipe Line Company floating roof tank at Humboldt, Kansas.

A new approach to floating roof tank protection

Now for the first time, an integral Foam-making and Foam-distribution system that brings truly modern fire protection to floating roof tanks.

Tank fires usually occur in tanks of the floating roof type. Lightning is the chief cause of these fires.

Portable Foam hose lines could put out these vapor seal fires — *if* there was sufficient manpower — *if* the Foam lines could be placed into operation soon enough — *if* the hose streams could be brought close enough to the fire. There were too many "ifs" to this system. There must be a better way — and there was!

Rockwood, working in conjunction with Sinclair Pipe Line Company, developed a unique and practical method —

A compact, more economical, more effective integrated system that is actually built into the tank! This system insures speedy Foam delivery and distribution in the critical vapor seal space between the tank wall and the floating roof.

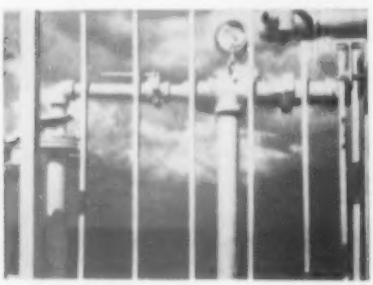
Here's an entirely new approach to protecting floating roof tanks. It not only minimizes losses, but permits the fire to be put out by one man if necessary and increases the safety of fire fighting personnel. Write for full information on this unique fire fighting idea!

ROCKWOOD SPRINKLER COMPANY

Engineers Water . . . to Cut Fire Losses

Distributors in all principal cities

Tee-shaped Distributor Nozzle discharging Foam from Rockwood Foam Maker Unit into vapor seal space between floating roof and tank wall.



This stair platform at top of tank shows the Foam Hydrant (top right) and Rockwood Foam Maker Unit (center) which is located so as to deliver Foam to roof area below stair platform.

Gasoline engine driven fire pump, Foam liquid storage tank and Rockwood around-the-pump Foam proportioning system at Sinclair's Humboldt Station. This unit has a Rockwood "L" type Metering Valve and Rockwood "B" proportioner.

ROCKWOOD SPRINKLER COMPANY
Portable Fire Protection Division
1069 Harlow Street
Worcester 5, Mass.

Please send me full information on the Rockwood Integral Foam-making and distribution system.

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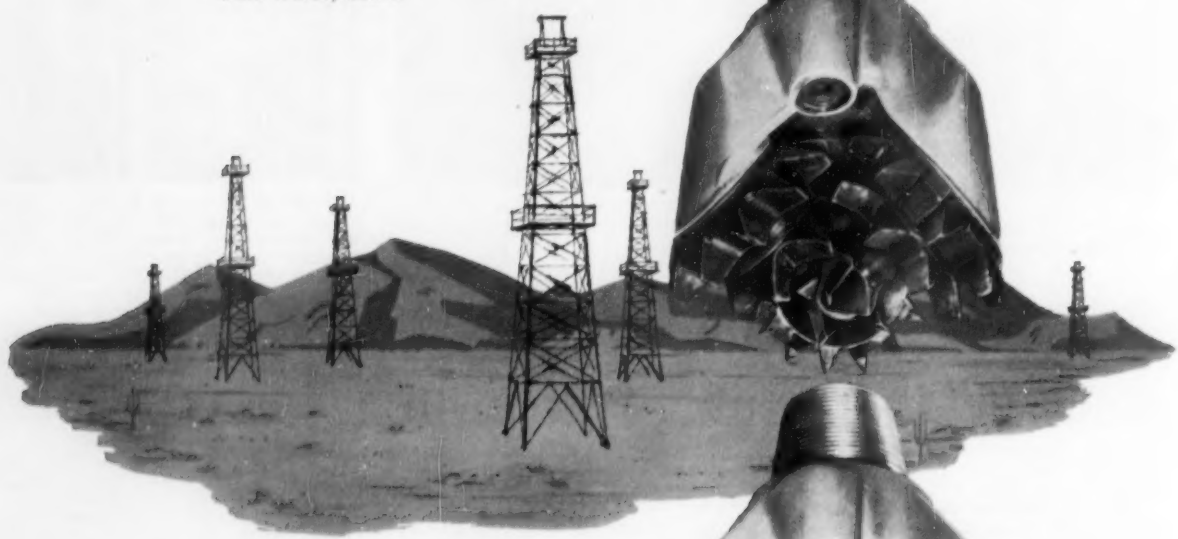

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tenth annual convention, Palais du Commerce, Montreal.

10-15 American Petroleum Institute, Production Division midyear standardization conference, Brown Palace and Cosmopolitan Hotels, Denver.

11-15 American Institute for the Advancement of Science, Gordon Research on Conference on Catalysis and Petroleum, Colby Junior College, New London, N. H.

13 Pennsylvania Grade Crude Association, thirty-third annual meeting, Bradford, Pa.

17-22 American Society for Testing Materials, annual meeting, Chalfonte-Haddon Atlantic City, N. J.

17-23 World Power Conference, Vienna.

21-22 Western Petroleum Refiners Association, regional technical—industrial relations meeting, Broadview Hotel, Wichita.

21-23 American Association of Petroleum Landmen, annual convention, Denver.

26-29 Canadian Gas Association, Manoir Richelieu, Murray Bay, Que.

28-30 Rocky Mountain Oil and Gas Association, board of directors, Hotel Utah, Salt Lake City.

AUGUST

2-4 Rocky Mountain Mineral Law Foundation, Second Annual Institute, University of Colorado, Boulder.

SEPTEMBER

11-13 Pacific Coast Gas Association, annual meeting, Coronado, Calif.

13-15 Chemical Institute of Canada, third Western Regional Conference, Edmonton, Alta.

17-21 Instrument Society of America, eleventh annual international instrument-automation conference and exhibit, New Coliseum, New York City.

20-21 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Hotel Henning, Casper, Wyo.

20-21 Mid-Continent Oil and Gas Association, Louisiana-Arkansas division, annual membership meeting, Roosevelt Hotel, New Orleans.

24-26 American Society of Mechanical Engineers, petroleum mechanical engineering conference, annual meeting, Statler-Hilton Hotel, Dallas.

26-28 Rocky Mountain Mineral conference, American Institute of Mining, Metallurgical & Petroleum Engineers, Newhouse Hotel, Salt Lake City.

OCTOBER

2-3 Texas Mid-Continent Oil and Gas Association, thirty-seventh annual meeting, Rice Hotel, Houston.

7-9 American Association of Oil Well Drilling Contractors, annual meeting, Texas Hotel, Fort Worth.

14-17 American Institute of Mining, Metallurgical & Petroleum Engineers, Petroleum Branch, fall meeting, Biltmore Hotel, Los Angeles.

15-17 American Gas Association, annual meeting, Atlantic City, N. J.

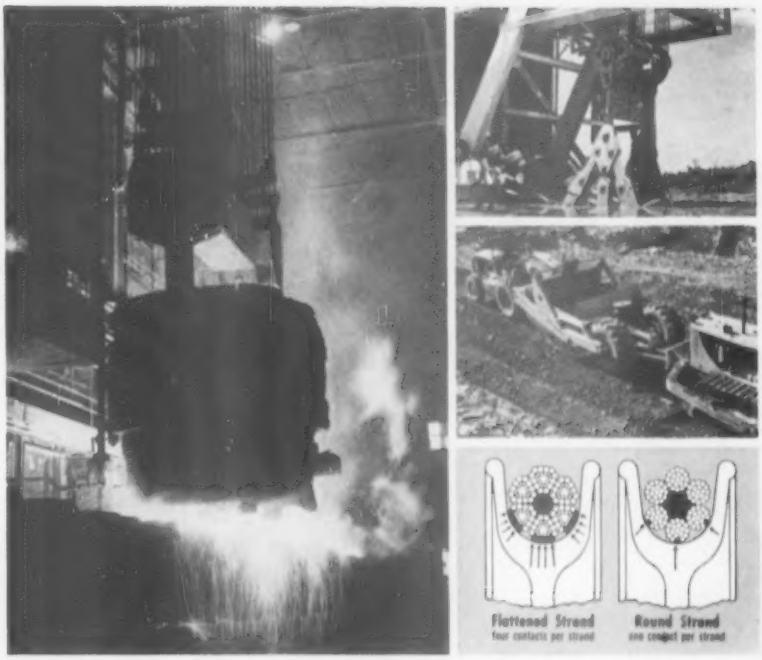
18-19 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Rufus Garrett Hotel El Dorado, Ark.

22-24 Rocky Mountain Oil and Gas Association, annual convention, Cosmopolitan Hotel, Denver.

29-Nov. 1 Society of Exploration Geophysicists, national convention, New Orleans.

NOVEMBER

25-30 American Society of Mechanical Engineers, Statler Hotel, New York.



How to handle the tough jobs with Hercules Flattened Strand wire rope

When you think you need a super-rope, check Hercules Flattened Strand. This is the wire rope that packs in 10% more steel than round strand rope, making it 10% stronger and safer. It wears longer and more evenly—reduces sheave wear, too.

The 10% extra strength over round strand rope is sometimes the difference between the possible and the impossible. Hercules Flattened Strand frequently does the tough jobs which would otherwise require larger size rope—and without the bother and expense of changing sheaves and drums. The extra strength is useful, too, when shock loading is involved. Saves rope—and money.

If you think that Hercules Flattened Strand wire rope may solve a problem, talk it over first with your Leschen man. He can be reached through your nearby Leschen distributor. His advice is based on the best possible authority—Leschen's long experience and engineering research—the longest in the industry. And with Leschen wire rope you are assured of higher-than-rated quality.

If you can use Hercules Flattened Strand rope you'll be money ahead. See about it soon.

Depend on Leschen's higher-than-rated quality.

LESCHEN WIRE ROPE DIVISION
H. K. PORTER COMPANY, INC.
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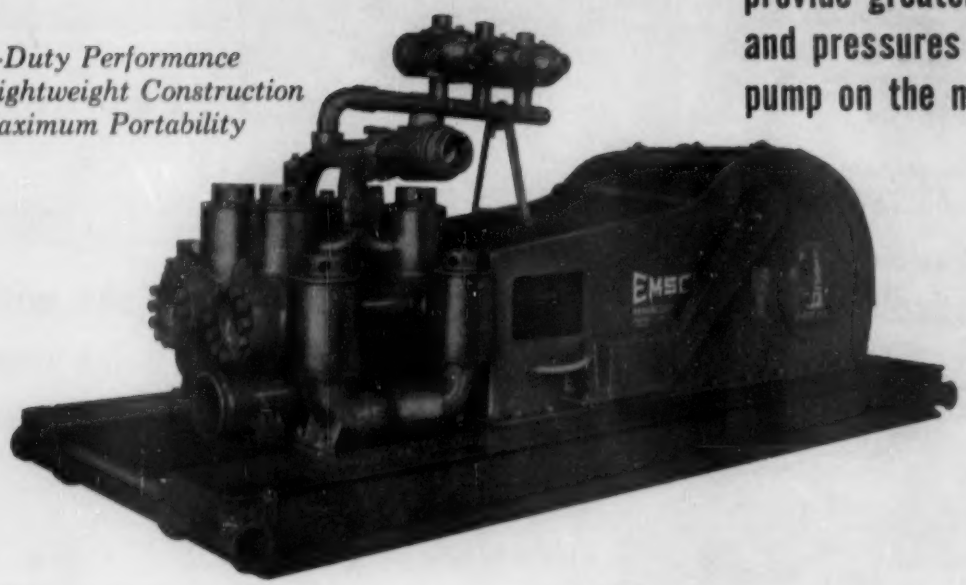
HERCULES Red-Strand® WIRE ROPE

FROM ANY STANDPOINT YOU'LL FIND EMSCO

SLUSH PUMPS

Heavy-Duty Performance with Lightweight Construction and Maximum Portability

provide greater volumes and pressures than any pump on the market!



1 Fabriform construction of the power end, originated and developed by EMSCO, uses steel plates and shapes instead of bulky, heavy iron castings and provides a light, rigid frame.

2 Wide-faced, forged steel, heat-treated herringbone gears provide quiet and efficient speed reduction.

3 EMSCO's patented "exposed" liner design eliminates all fluid washouts caused by liner packing failure since the slightest leak may be detected immediately.

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5 Fluid end is of 8-pot design, with each valve in a separate pot or valve chamber. Threaded valve-pot covers provide quick and easy access to valves—reduce bulk and weight.

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SP-602

The OIL AND GAS JOURNAL

TULSA, OKLAHOMA

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JOURNALLY SPEAKING . . .

To Coin a Phrase

IT isn't often that we are deliberately evangelical in this department, but now and then the spirit moves us to rise up and right a great wrong.

Our cause this week is to find a nice family name for a group of stepchildren. The stepchildren are natural gasoline, liquefied petroleum gas, and other products of field processing plants which form the subject of most of the articles in this issue of our favorite oil magazine.

They are really stepchildren of the petroleum industry. When they first made their appearance they were contemptuously referred to as drips—not in the modern slang use of the term but because they dripped out of drain cocks in low spots in gas pipelines. Later they were called casing-head gasoline, a somewhat more respectable if not very elegant designation.

Then somebody, probably an advertising genius or promotion man, coined the term natural gasoline, a name which obliterated any suspicion of illigitimacy of parentage and which otherwise served quite handily to describe the origin and nature of the product to which it was applied. Probably about the same time the initials L.P.G. (variously used with or without periods or hyphens) came into common use as a respectable, descriptive, and easy cognomen for the twin-brother liquefied petroleum gases butane and propane.

All was well on the nomenclature front as long as the industry remained simple and natural gasoline and L.P.G. were the only significant products of what were commonly designated as natural-gasoline plants. But then along came condensate, cycling plants, recycle gasoline, isobutane, propylene, ethane, and many other products of what now have come to be known as field processing plants as distinguished from crude-oil refineries.

It's true that each one of these products has a given name which serves the purpose of individual identification quite well. But the clan of relatives is so large and so important that it ought to have a family name. A name that will fit well into a headline, for instance.

Pity the poor headline writer who tries to cram into a short space such generic designations as "products of natural-gasoline and cycling plants," or "natural gasoline, L.P.G., and related production of field processing plants," or even "light hydrocarbon liquids." All of these phrases, and others, have been used on occasion to describe the family group.

One of our readers (yes, we have a few) wrote in to suggest that the whole kit and kaboodle be christened the Liquid Gas Group, which, of course, soon would be shortened down to the convenient initials L.G.G. Not bad, that.

However, we have a better idea (better because it's our own). We nominate N.G.L. as a family monicker for all liquid products tracing their ancestry from petroleum in its gaseous phase. N.G.L. stands for Natural-Gas Liquids, a phrase that ought to cover everything from raw condensate and casing-head gasoline out in the field to the highly fractionated and college-educated city cousins like neophane and isoheptane.

The term "natural-gas liquids" has been used for some time by various trade and government groups, and it seems quite fitting. We note with approval that it is catching on rather generally and that many people in the industry are using it more or less spontaneously.

That's fine as far as it goes, but it's still quite a mouthful. So we're going to plug for popularization of the short form—N.G.L. It's the trend to use initials for most everything these days, from Government agencies like FPC to chemicals like TEL and oil-field terms like MER. Since L.P.G. became so universally accepted, we think N.G.L. should be a natural.

N.G.L. is short, descriptive, easy to say and to write, and shouldn't get confused with any other common abbreviation used by the petroleum industry.

Besides, N.G.L. fits so neatly into a headline.

—*Henry D. Ralph.*

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Thousands of BAKER CEMENT RETAINERS have been *successfully used* for placing cement, plastic, acid, or other fluids through tubing or drill pipe *at the place* where they will be *most effective*, behind the casing or liner; or *around the shoe*, or *into open hole* below the shoe. To be specific, Baker Cement Retainers are universally used for these important—and often troublesome—applications . . .

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BAKER CEMENT RETAINERS can be safely run in on tubing or drill pipe, and set by any experienced crew. After reaching the desired depth, a small Tripping Ball is dropped down the running-in string and pump pressure applied to build up the necessary hydraulic pressure to expand the packing element and set the slips. The resilient rubber packing element, which is prevented from flowing by lead rings, ensures a positive pack-off. Opposed slips prevent movement of the Retainer in either direction after it is set. Once set, the Retainer will remain in position and provide a leak-proof pack-off against any pressure imposed upon it, that is safe for the casing.

Cast iron construction is recommended for *permanent* installations, or where harmful well fluids are present; Magnesium Alloy Retainers are available for *temporary* installations. Retainers constructed of either material drill up quickly and easily because of the minimum material to be disposed of, and because both the Body and Slips are designed to break up and drill out readily.

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Oil needs more Washington savvy

WASHINGTON—It takes but a brief time in this city to sense the difference in atmosphere between the nation's capital and a commercial city, particularly any one of dozens of oil centers.

In Washington the prevailing attitude is cynicism, propaganda, and political intrigue. Nothing is taken at its face value. Ideas are evaluated not on their merit but on who is for or against them. Conclusions are reached on the basis of who has the last word or the cleverest slogan. Positions are taken on the basis of deals and compromises.

It is in such a background that the nation's laws are made and administered and the nation's opinions molded by reporters and propagandists. Failure to appreciate this is an underlying cause for oil men's perplexity and frustration with what comes out of Washington.

OIL IS AN UGLY WORD in Washington at present. The entire oil and gas industry is viewed with unusual suspicion—a condition which causes open glee in a city where everything is always suspect anyway.

The fact that the gas bill got vetoed because of one oil lawyer's $2,500 indiscretion is considered an amusing twist to an otherwise routine game of political pressuring. Now Washington is waiting to see what sort of a political deal the oil industry will make in order to get the gas bill up again.

For example, it is seriously suggested that the industry surrender its percentage depletion as a trade for freeing gas producers from federal regulation. Of course the two have absolutely no connection, but this illustrates the Washington psychology.

Another example is the general expectation that the oil industry will make some sort of a deal with the Senate lobbying-investigating committee to go easy on it in return for industry surrender of parts of its legislative program.

IF THIS AMAZES OIL MEN it's because they don't have an adequate awareness of what makes Washington tick. They don't like Washington, and they spend as little time here as possible. They are quickly repelled by the peculiar standards of values and patterns of reaction.

This is most unfortunate, because oil's future course will be determined more and more on political action and public opinion formulated in this Washington atmosphere, whether we like it or not.

Oil needs a better understanding of Washington. It also needs more policy-level representation here. Of particular help would be an industry-wide spokesman to make prompt and vigorous statements on every issue and grind out the reams of press releases on which opinion feeds.

In short, oil needs more Washington savvy if it is to combat its opponents in the political and propaganda arena on equal terms.

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...Less Cost, Too

● First used nearly thirty years ago in the East Texas field, then rapidly spreading throughout the Panhandle fields, Central and West Texas and other areas, 'INCOR' 24-Hour Cement reduced the cost of "waiting on cement," saving lost rig time and delayed production.

Always-dependable 'Incor' performance has resulted in steady year-after-year increases in the use of America's first high early strength or so-called 'quick-set' cement.

And now 'INCOR' SULPHATE RESISTANT CEMENT—'A DUAL PURPOSE OIL WELL CEMENT' is in steadily widening demand. It provides protection against sulphate attack where needed.

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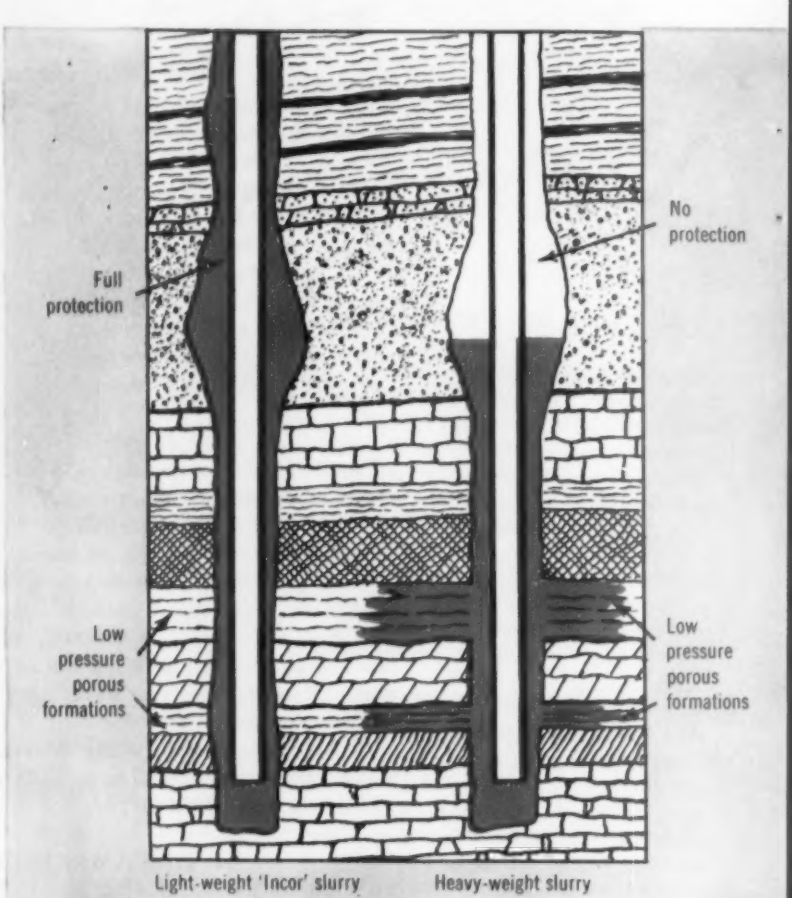
There's a Lone Star Cement for every oil well condition—just select the one that fits your job. Performance counts!

*Reg. U. S. Pat. Off.



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Current and significant in . . .

The Industry This Week

Exploration

• **The best-looking structures** he's ever seen is how a veteran geophysicist describes Hunt International's concession in West Pakistan. Both Hunt and Stanvac have shipped rigs to the country and should be drilling in 2 months. P. 94.

Australia's deepest hole—the 15,188-ft. Cape Range 2—has been abandoned as dry. It's the latest in a long list of disappointments for WAPET. But the firm now plans several structure tests. P. 91.

Two big events in Cuban exploration have developed: Jersey Standard's active return, and discovery of the island's first salt dome. Jersey acquired three-fourths of Cuban-Canadian concession. Cuban Kewanee found the salt dome which is exciting new interest. P. 93.

Natural Gas

• **Ratable taking of gas** draws both bouquets and brickbats at TIPRO meeting. Railroad Commissioner Murray says it's surely coming, but speakers disagree over whether it will help or hinder the small producer. P. 74.

Underground storage for natural gas is playing a bigger role in the industry. Capacity increased 12.4 per cent during past year, more than tenfold since the end of World War II. It's stabilizing pipeline loads and providing adequate gas supplies for winter heating peaks. P. 68.

Refining

• **El Paso Natural** will build a refinery in Northwest New Mexico—near its Wingate fractionation plant. The plant is the latest in a series of moves which is putting this gas company solidly in the refining industry. P. 72.

A new isomerization process, Penex, is announced by U.O.P. It will upgrade natural gasoline and refinery naphthas. Still another new isomerization process is due to be announced within a week. P. 86.

Jet-fuel demands for commercial airlines, alone, will reach nearly 1,000,000 bbl. daily in 1962, S.A.E. meeting is told. This forecast nearly doubles previous high jet-fuel demand estimates. P. 86.

Refinery realization is much improved, but refinery prices still will have to go up if a crude hike materializes. Mid-Continent refiners are doing better than those on the Gulf Coast, but both areas have seen a big gain since the low point in mid-1954. P. 76.

Drilling

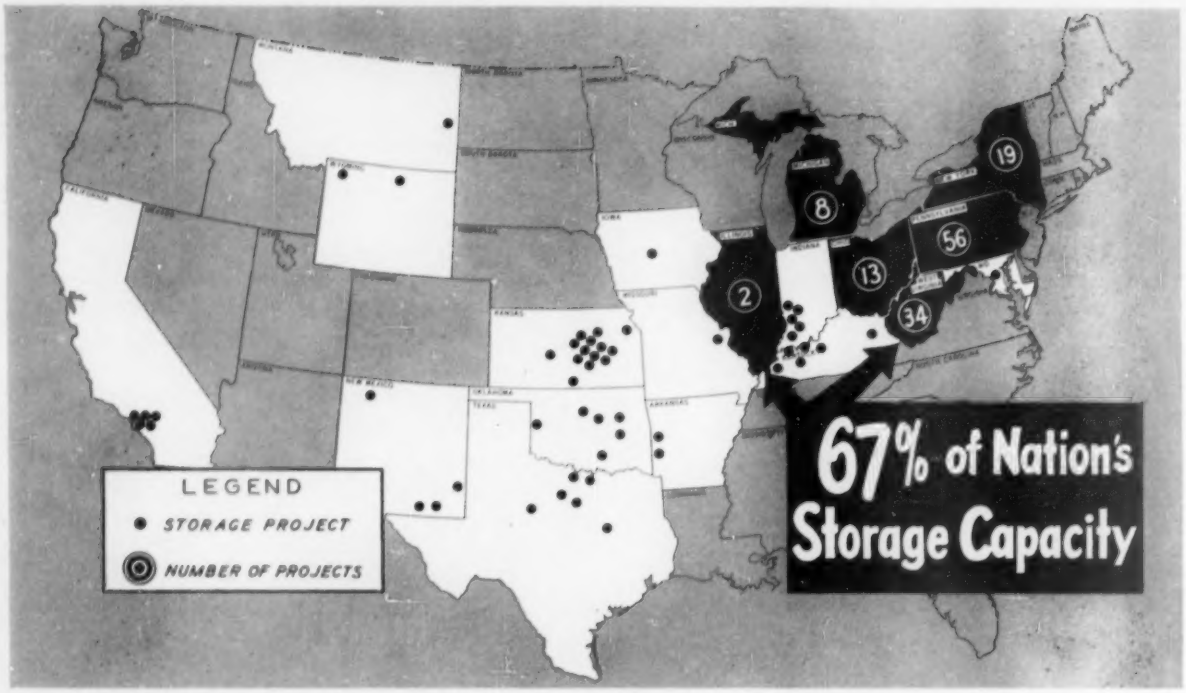
• **Foreign drilling has reached new record levels.** The reasons: new discoveries and high world demand. New concession grants promise a continued increase in activity. P. 92.

Deep drilling below 10,000 ft. will rise 90 per cent in the next 10 years. That's the prediction of Humble's Reistle. He expects a sevenfold increase in the number of wells drilled to 16,000 ft. P. 73.

Pipelines

• **Texas Eastern will proceed "at its own risk"** with operation of the "substitute Little Inch" natural-gas line. But the temporary FPC approval didn't cover conversion of the Little Inch to products. That battle is still to be won. P. 85.

An advanced double-jointing system is ready for use by pipeline builders. Developed by M. J. Crose, it will speed pipe laying and cut costs on 26-in. job for T.G.T. P. 80.



UNDERGROUND STORAGE for natural gas, concentrated in Upper Midwest and Northeast, permits pipeline delivery of winter supplies during low-demand summer months.

Underground Gas Storage Still Rising

● Half of space-heating requirements on coldest winter days can now be supplied by some pipelines from storage

Gene T. Kinney

THE continued healthy expansion of underground storage for natural gas is good news to producers seeking wider markets, to pipelines which move the gas, and to utilities which sell it.

Capacity has grown 12.4 per cent during the past year. And projects now under way or planned promise another substantial boost for 1956.

An Oil and Gas Journal survey shows that underground storage capacity now totals 1,796,464,943 M.c.f. This compares with 1,598,946,016 M.c.f. reported last year in the Journal.

The survey shows that 48 companies are storing natural gas in 183 reservoirs (generally depleted gas fields) in 19 states.

The capacity of these listed projects is below the actual industry total because of the reluctance of a few companies to release up-to-date figures. Only two failed to respond in the survey. Their aggregate capacity was 20,000,000 M.c.f. For these companies the table carries last year's figures, since they have announced no expansion. In a few other cases, capacities reported are known to be low.

In light of these facts it seems certain that U. S. underground storage for natural gas passed two trillion cubic feet during the past year.

Importance of storage . . . The survey points up the increasingly significant role being played by underground storage.

Although 41 years old, it didn't become an important factor in the natural-gas industry until after World War II.

Capacity has since multiplied more than tenfold. It has grown to the extent that storage will supply as much as half of the space-heating requirements for some gas companies during the coldest days of the winter. It is directly responsible for lowering operating costs of some pipelines. They have stabilized their year-round load factor by moving winter supplies into storage during low-demand summer months.

Everybody benefits . . . Without storage, pipelines would have to add considerable capacity if peak demands were to be met during the heating season.

There would be large volumes of gas with no market, or an inferior market, during the summer. This valuable gas would either have to be shut in or wasted, particularly if produced with oil. Besides these advantages of underground storage, there are many others:

. . . Pipeline facilities are operated to the maximum economic advantage with the load stabilized.

. . . A more uniform and economical rate of purchase is maintained by utilities because of the improved load factor.

. . . Utilities get a better price for part of their gas. The volume formerly sold at interruptible and off-peak rates will bring the much-higher heating rate.

. . . More gas for winter requirements is provided without exceeding contract demands for gas purchased from pipelines.

Northern Natural . . . Northern Natural Gas Co.'s half-million house-heating customers use about 15 times as much gas on the coldest day of the winter as they do on the hottest day of the summer.

So underground storage is essential to smooth and economical operation. But when the company looked around for depleted fields in its market area,

(Continued on page 70)

Who's Storing Natural Gas Underground, Where and How Much

Company, field—county—	Capacity in M.c.f.
ARKANSAS	
Arkansas-Oklahoma Gas Co.:	
Lavaca—Sebastian	4,280,000
Shibley—Crawford	1,010,000
CALIFORNIA	
Pacific Gas & Electric Co.:	
Pleasant Creek—Yolo	3,250,000
Pacific Lighting Gas Supply Co.:	
LaGoleta—Santa Barbara	14,400,000
East Whittier—Los Angeles	1,500,000
San Diego Gas & Electric Co.:	
San Diego	*18,487
Southern California Gas Co.:	
Playa del Rey—Los Angeles	3,000,000
ILLINOIS	
Mississippi River Fuel Corp.:	
Waterloo—Monroe	12,000,000
Natural Gas Storage Co. of Illinois:	
Herscher—Kankakee	90,000,000
INDIANA	
Indiana Gas & Water Co.:	
Monroe—Monroe	1,500,000
Unionville—Monroe	1,500,000
Greensburg—Decatur	1,000,000
Texas Gas Transmission Corp.:	
Oaktown—Knox	1,038,100
Alford—Pike	2,469,300
IOWA	
Northern Natural Gas Co.:	
Dallas	$50,000,000
KANSAS	
Cities Service Gas Co.:	
Boyer—Butler	986,476
Colony—Anderson	7,937,821
North Welda—Anderson	9,691,648
South Welda—Anderson	11,572,864
McLouth—Jefferson, Leavenworth	11,727,093
Craig—Johnson	5,860,411
Piqua—Allen, Woodson	3,832,677
Consolidated Gas Utilities Corp.:	
Collinson—Cowley	1,100,000
Sutcliffe—Neosho	700,000
Union Gas Systems, Inc.:	
Longton—Chautauqua	
Elk City—Elk, Montgomery	
Liberty South—Montgomery	8,620,000
Liberty North—Montgomery	
Buffalo—Wilson	
Fredonia—Wilson	
KENTUCKY	
Central Kentucky Natural Gas Co.:	
Menifee—Menifee	6,000,000
Louisville Gas & Electric Co.:	
Doe Run—Meade	3,000,000
Muldraugh—Meade	1,750,000
Texas Gas Transmission Corp.:	
Dixie—Henderson	7,114,000
Hickory—Daviess	1,000,000
Grandview—Daviess	612,480
MARYLAND	
Washington Gas Light Co.:	
Montgomery	*70,000
MICHIGAN	
Michigan Consolidated Gas Co.:	
Austin—Mecosta	7,400,000
Goodwell—Newaygo	14,500,000
Reed City—Osceola	13,000,000
Lincoln-Freeman—Mecosta	9,100,000
Six Lakes—Mecosta, Montcalm	53,000,000
Michigan Gas Storage Co.:	
Cranberry Lake—Clare	6,726,000
Winterfield—Clare	16,813,000
Riverside—Missaukee	1,500,000
MISSOURI	
Laclede Gas Co.:	
Florissant—St. Louis	20,000,000
MONTANA	
Montana-Dakota Utilities Co.:	
Baker—Fallon	50,000,000
NEW MEXICO	
El Paso Natural Gas Co.:	
Rhodes—Lea	65,000,000
Southern Union Gas Co.:	
Keyes—Eddy	1,805,183
Vandargriff—Eddy	3,110,682
Barker-Dakota—San Juan	14,926,961
NEW YORK	
Home Gas Co.:	
Dundee—Schuyler	8,200,000
Gilbert—Allegany	550,000
Greenwood—Steuben	1,550,000
Iroquois Gas Corp.:	
Collins—Erie	1,800,000
Derby—Erie	200,000
Holland—Erie	1,500,000
Quaker—Erie	500,000
Rawlins—Erie	900,000
Zoar—Erie	518,000
E. Aurora—Erie	1,600,000
Bennington—Wyoming	3,500,000
Manufacturer Light & Heat Co.:	
Gilbert—Allegany	550,000
Dundee—Schuyler	6,150,000
Greenwood—Steuben	325,000
Republic Light, Heat & Power:	
Arkwright—Chautauqua	400,000
Sheridan—Chautauqua	1,600,000
Sylvania Corp.:	
Tuscarora—Steuben	2,000,000
Tennessee Gas Transmission Co.-Iroquois Gas Corp.:	
Colden	10,000,000
Tennessee Gas Transmission Co.—New York State Nat. Gas Corp.:	
State Line	40,000,000
OHIO	
East Ohio Gas Co.:	
Stark-Summit—Stark-Summit	66,200,000
Chippewa—Wayne	4,000,000
Columbiana—Columbiana	3,000,000
Manufacturers Light & Heat Co.:	
Brinker—Columbiana	6,600,000
Natural Gas Co. of West Virginia:	
Lima-Mahoning	2,000,000
Ohio Fuel Gas Co.:	
Benton—Hocking	36,700,000
Weaver—Ashland, Richland	69,000,000
Knox—Knox	3,400,000
Wellington—Lorain, Medina	17,000,000
Pavonia—Ashland	27,000,000
Holmes—Holmes, Wayne	16,700,000
Guernsey—Guernsey, Coshocton	4,700,000
Zane—Muskingum	80,000
OKLAHOMA	
Consolidated Gas Utilities Corp.:	
Ulan—Pittsburg	13,500,000
Oklahoma Natural Gas Co.:	
Depew—Creek	57,000,000
Haskell—Muskogee	10,900,000
Osage—Osage	2,730,000
Sayre—Beckham	89,300,000
Southwest Natural Gas Co.:	
North Ada—Pontotoc	10,000,000
PENNSYLVANIA	
Carnegie Natural Gas Co.:	
Bickerton—Allegheny	130,000
Equitable Gas Co.:	
Bunola—Allegheny	5,182,935
Tepe—Allegheny	1,532,872
Hunters Cave—Greene	3,056,767
Pratt—Greene	4,350,702
Kirby—Greene	2,761,900
Finleyville—Washington	484,835
Swarts—Greene	986,212
Manufacturers Light & Heat Co.:	
Cross Creek—Washington	Being depleted

Company, field—county—	Capacity in M.c.f.
Donegal—Washington	6,300,000
Heard—Washington, Greene	7,500,000
Holbrook—Greene	1,000,000
Iowa—Jefferson	380,000
Irwin—Westmoreland	505,000
Majorsville—Washington, Greene	30,000,000
McKinley—Elk	Being depleted
Munderf—Jefferson	90,000
Rush Run—Westmoreland	Being depleted
New York State Natural Gas Corp.:	
South Bend—Armstrong, Indiana	17,000,000
Sharon—Potter	5,500,000
Tioga—Tioga	22,400,000
Sabinsville—Tioga	33,350,000
N.Y.S.N.G. Corp.-Texas Eastern Transmission Corp.:	
Oakford—Westmoreland	105,000,000
N.Y.S.N.G. Corp.-Tennessee Gas Transmission Co.:	
Harrison—Potter, Pa., Steuben, N. Y.	32,800,000
Ellisburg	44,000,000
North Penn Gas Co.:	
Farmington—Tioga	10,000,000
Meeker—Tioga	5,000,000
Pennsylvania Gas Co.:	
Total for eight fields	8,032,435
Peoples Natural Gas Co.:	
East McKeesport—Allegheny	Inactive
Gamble-Hayden—Allegheny	2,280,000
Haverline—Allegheny	150,000
Murrysville—Allegheny	2,990,000
Colvin—Washington	2,480,000
Mount Royal—Allegheny	500,000
Truittsburg—Clarion	3,575,000
Patton—Westmoreland	150,000
Webster—Westmoreland	1,140,500
United Natural Gas Co.:	
Belmouth—Elk	400,000
Boone Mt.—Elk	900,000
Bullers—Jefferson	30,000
Galbraith—Jefferson	1,000,000
Henderson—Mercer-Venango	1,600,000
Markle—Jefferson	60,000
Mohan Run—Elk	70,000
Queen—Warren-Forest	150,000
St. Marys—Elk	140,000
Wellendorf—McKean	280,000
United Natural-Pennsylvania Gas Co.:	
Keelor—McKean	1,300,000
United Natural-Tennessee Gas Transmission Co.:	
Hebron—Potter	22,500,000
TEXAS	
Lone Star Gas Co.:	
New York City—Clay	6,000,000
Leeray—Stephens	7,080,000
View—Taylor	3,000,000
Ambassador—Clay	2,500,000
Tri-Cities—Henderson	35,000,000
WEST VIRGINIA	
Atlantic Seaboard Corp.:	
X-56—Upshur	6,000,000
Equitable Gas Co.:	
Hayes—Marion	450,000
Drain—Doddridge	302,154
Skin Creek—Lewis	1,182,756
Comet—Taylor	4,462,879
Maple Lake—Taylor	1,840,573
Logansport—Marion	2,948,240
Godfrey L. Cabot, Inc.:	
Fayetteville—Fayette	33,000
Hope Natural Gas Co.:	
Bridgeport—Harrison, Taylor	9,500,000
Fink—Doddridge, Lewis	56,000,000
Kennedy—Harrison, Lewis	31,000,000
Newberne—Gilmer	5,000,000
Racket—Gilmer	4,000,000
Pitzer—Marion	1,000,000
Crows Run—Wetzel	750,000
Manufacturers Light & Heat Co.:	
Victory—Marshall, Wetzel	34,500,000
United Fuel Gas Co.:	
X-1—Putnam	3,800,000
X-2—Kanawha	4,900,000
X-4—Putnam	3,150,000
X-6—Kanawha	6,000,000
X-7—Kanawha	1,500,000
X-8—Kanawha	2,000,000
X-15A—Putnam	1,700,000
X-15B—Kanawha	2,300,000
X-17—Roane	2,800,000
X-19A—Roane	2,400,000
X-19B—Roane	2,000,000
X-49—Putnam	2,000,000
X-52A—Kanawha	26,800,000
X-52B—Kanawha	7,000,000
X-53—Kanawha	50,000
X-54—Kanawha	4,000,000
X-58—Wood and Wirt	8,000,000
X-59—Jackson	20,000,000
WYOMING	
Montana-Dakota Utilities Co.:	
Billy Creek—Johnson	2,500,000
Elk Basin—Park, Wyo., Carbon, Mont.	25,000,000
Total	1,796,464,943

*Underground high-pressure pipe. ‡Being abandoned. §Ultimate.

there were none available. It was forced to the next-best prospect: a nonproductive formation of porous rock naturally sealed by impervious rock or water.

A water reservoir meeting these requirements was found 30 miles west of Des Moines. Gas pumped into the sand under pressure is displacing the water. The company expects to have 12 billion cubic feet in storage by the end of the summer. A peak-day delivery capacity of 50 million cubic feet should be available for the heating season. Ultimate capacity will be 50 billion feet. That will afford a peak-day delivery of 200 million cubic feet.

And here's the most attractive feature of the project. Northern Natural was able to develop the storage for less than 20 per cent of the cost of building the same amount of pipeline capacity to the gas fields.

Consolidated Natural . . . The huge Consolidated Natural Gas Co. group operates 26 large underground storage fields. The group includes East Ohio Gas Co., Hope Natural Gas Co., Peoples Natural Gas Co., River Gas Co., and New York State Natural Gas Corp.

The group spent $5,200,000 last year to increase storage capacity, and at the start of last heating season had 274,352,000 M.c.f. in the ground. The biggest project was enlargement of Harrison field, one of three in the Potter County area of Pennsylvania being developed jointly with Tennessee Gas Transmission Co.

The outlay for this expansion was $2,925,000. Consolidated Natural has budgeted $7,500,000 for building storage in 1956.

The extent to which the system depends on storage is shown by the fact it took 106,681,000 M.c.f. from underground vaults last heating season. That's 35 per cent of the total requirements through the heating season and 54 per cent on the peak day.

Columbia Gas System . . . On the 1955 peak day, the huge Columbia system made 46 per cent of its deliveries from storage.

As of October 1, 1955, 307.5 billion cubic feet of gas was stored in 44 fields by the system, which includes Columbia Gas System Service Corp., United Fuel Gas Co., Ohio Fuel Gas Co., Manufacturers Light & Heat Co., and others.

Columbia spent more than $14 million last year improving and expanding storage facilities. One new field was activated.

Peoples Gas Light & Coke . . . Some $25 million is being sunk in the Herscher field, near Chicago, operated by Natural Gas Storage Co. of Illinois.

The storage firm is owned jointly by Texas Illinois Natural Gas Pipeline Co. and Natural Gas Pipeline Co. of America, subsidiaries of Peoples Gas Light & Coke Co.

This huge underground gas bank, with ultimate capacity of 90 billion cubic feet, will permit Peoples Gas to get a better price for a large volume of its gas. Deliveries which have been made at interruptible rates of 2.7 cents and off-peak rates of 3.7 cents per therm (roughly 100 cu. ft.) can now be made at the space-heating rate. That means the gas will bring more than twice its former price, or some 8.8 cents per therm.

The Federal Power Commission has authorized expansion to 430 million cubic feet per day in the Herscher peak-day delivery capacity. This $7,500,000 project will include a gathering system to recover gas vented from old wells, a reinjection system, and 31 miles of 36-in. pipeline.

Herscher's peak deliverability was expanded from 150 to 300 million cubic feet during the winter, and was capable of delivering one-third of the space-heating load on the coldest day in Chicago. Next winter 45 per cent of the customers will be supplied by the important storage project. It has permitted the companies it serves to add 100,000 more space-heating connections in the Chicago area.

Because of the success of Herscher, Peoples Gas is looking for other fields for storage in Central Illinois.

Iroquois storage . . . Iroquois Gas Corp. plans to spend $2,877,000 to develop additional storage this year.

The company will build 14 miles of delivery pipeline, 22 miles of gathering and well lines, and drill 16 wells. Sixty-four wells will be reconditioned and a 900-hp. compressor added.

The purpose is to permit the purchase of gas at a high load factor during the summer, to avoid payment of penalties, and to buy more low-cost surplus gas as it becomes available.

Future of storage . . . The estimated two trillion cubic feet of storage represents an investment of some $350 million, and the industry is still growing as fast as facilities can be developed.

Present projects are being expanded and new fields are being bought. In areas where there has been no gas production, or where all the fields have been purchased, companies are wildcatting for nonproductive reservoirs such as Northern Natural is developing.

It is safe to say that the transmission industry could not have grown so big so fast without the solution to the problem of fluctuating demand offered by underground storage. The multiple benefits of storage to all—from the producer seeking increased outlets to the consumer — assure its continued growth for some time to come.

watching WASHINGTON

. . . with Bertram F. Linz

Coal wants part of oil market, too . . .

THE coal industry also would like to grab off a piece of the gasoline market.

The House this month ordered its interior committee to study a research program for coal similar to those now conducted for atomic industry and aviation. A major feature would be a review of previous work on synthetic liquid fuels and a determination whether a full-sized plant should be built to develop techniques.

Between the farmer and the coal miner the oil producer could lose a big part of his market. The blending of alcohol with gasoline would take 5 per cent of the latter. Synthetic liquid fuels would aim at an even larger percentage. Translated into crude production, the two could halt oil industry expansion in its tracks.

The coal interests have a couple of good arguments for the research program. "It is inevitable that the exhaustion or conservation of other fuels will require synthetic fuels to assume major importance in supplying the energy requirements of the nation in time of war and peace," the resolution for the study said.

And in an emergency, supporters declared, the military will make such tremendous demands upon the oil industry that great quantities of coal will have to be diverted as replacement fuel while its own markets will be calling for additional supplies.

Farm bloc to nurse fuel bill carefully . . .

DEVELOPMENT of industrial uses for agricultural products isn't going to get into the hands of the business-minded commerce committees if the farm bloc in Congress has its way. It's going to be managed by the agriculture committees, which are willing to spend any amount of money to make the farmer prosperous.

This was brought out in the farm bill vetoed by the President last week. The measure called for a research program for making alcohol from surplus crops for blending with motor fuel, rubber, plastics, and other materials. A five-man commission was to lay out the program by June 15, 1957.

The interesting aspect of the proposal was an "order" that any bill resulting from the study should be handled by the agriculture committees, an innovation in legislation.

The commerce committees ordinarily handle all measures relating to industry. But farm bloc members charge that previous efforts to push alcohol-gasoline blends and similar ideas have been smothered in those committees.

The order to send all bills to the agriculture committees was to be made a "rule" of both houses. But one session of Congress cannot bind succeeding sessions. If a later Congress wanted to change such a rule it could do so.

Congress may get check on military 'land grabs' . . .

CONGRESS, suspicious of "land grabs" by the military, may step in to control reservations for missile ranges and other uses.

The Defense Department has plans to acquire large areas—tens of thousands of acres in western states and millions of acres on the outer Continental Shelf. Most of the land can be set aside by presidential order. Congress may call for a review of such orders in the future.

A number of bills have been written requiring the military to explain just why they want any tract over 5,000 acres and get congressional approval before taking it over.

The department would have to explain also what effect withdrawal of land might have on the operation of the public land laws and federal regulations on conservation, utilization, and development of mineral and material resources and other values.

El Paso Plans Refinery

Plant serving Utah, New Mexico, Arizona, and Colorado area is pipeline firm's biggest move toward integration

GALLUP, N. M. — A streamlined major oil refinery 10 miles east of here in northwestern New Mexico will begin running San Juan basin crude oil late next year.

El Paso Natural Gas Products Co., a recently formed affiliate of the transmission giant, El Paso Natural Gas Co., will build the plant. It is to be operating by the fall of 1957.

The announcement of the new refinery was made last week by C. L. Perkins, vice president and general manager of the parent firm.

Process units . . . Neither size nor cost of the plant has been definitely fixed. Process facilities will include alkylation, Platforming, catalytic cracking, and vacuum units as well as crude distillation.

The new refinery will be located adjacent to El Paso Natural Gas' big Wingate fractionation plant and will use butane and natural gasoline produced by that plant. It will serve the four-state Utah, Colorado, Arizona, and New Mexico area, Perkins said. Construction will take from 15 to 18 months.

El Paso Natural Gas Products also will lay an extensive crude-oil gathering system and launch a big service station-bulk plant construction program.

C. L. Moore, vice president and general manager of the products company, said his firm will buy from its parent a 96-mile, 6-in. products line extending from the Wingate plant to the Blanco gasoline plant near Farmington. The company will convert it to a crude line to serve the new refinery.

Oil production in the Four Corners area is only around 1,000 bbl. daily. But recent discoveries have led many to believe that it is potentially a big producing province.

Expansion foreseen . . . Design of the new refinery is such, Moore said, that capacity can be expanded readily to meet future requirements in the region. He said also that he expects crude production to increase greatly by the time the plant is ready to operate.

Processing-engineering contract for the new refinery is held by Universal Oil Products Co., Des Plaines, Ill.

The plant will be capable of producing gasoline equal in octane number to any now on the market, Moore said. Gasoline quality can be improved relatively easily to meet future auto-engine requirements, the company said.

Products, in addition to regular and premium gasoline, will include kerosine, diesel fuel, distillates, and fuel oil.

Biggest integration step . . . Construction of the new refinery will be El Paso's biggest step yet in its drive to become a large refiner and marketer of oil products.

The drive was motivated primarily by the problem of marketing its huge natural-gas liquids production. This amounts to roughly 25,000 bbl. daily.

The company saw the need for a stable, year-round market for the product. The best solution, El Paso decided, was to become a refiner and marketer itself.

El Paso made its move in this direction last October by acquiring a 4,000-bbl. refinery at Brickland, N. M., seven product terminals, and about 125 retail outlets in West Texas, Arizona, and New Mexico. It absorbed McNutt Oil & Refining Co. through an exchange of stock.

It has proceeded at a rapid pace ever since, acquiring two other small refineries in northwestern New Mexico at Bloomfield and Prewitt from Malco Refineries, Inc., Roswell, N. M. The former is a 1,000-bbl. daily topping plant, the other a 3,000-bbl. refinery. Early next month, the company will finish expanding the Prewitt refinery to 4,000 bbl.

Other plans . . . In January the company announced plans to lay a 240-mile "larger-than-6-in." products line from the Odessa, Tex., area to El Paso. The line would carry natural gasoline, butane, and propane.

The company is to build an alkylation plant somewhere along the route of this line. The alkylate will be piped to El Paso and blended there in a new plant into premium motor fuel. Regular gasoline will come through a line from the Brickland refinery.

All of the El Paso refining, marketing, and products-pipeline activities have been turned over to El Paso Natural Gas Products. This firm also will administer El Paso's interest in the new $30,000,000 butadiene-synthetic-rubber plant under construction near Odessa by El Paso, General Tire & Rubber Co., United Carbon Co., and Odessa Natural Gas Co.

President of El Paso Natural Gas Products is Paul Kayser, who also heads the parent firm. Cecil P. McNutt, former vice president and general manager of McNutt Oil & Refining, is vice president and operating manager of refineries.

FPC Changes Rule

Rate suspension dropped as a result of court decision

WASHINGTON.—The Federal Power Commission bowed last week to a U. S. Supreme Court ruling that it cannot interfere with the operation of gas-sales contracts.

The FPC dropped its suspension of rate increases filed last fall by the J. M. Huber Corp., Borger, Tex., on sales to Panhandle Eastern Pipe Line Co. and Northern Natural Gas Co.

At the same time, it ordered an investigation of Huber's rates to determine whether they are "unjust, unreasonable, unduly discriminatory, or preferential." That is the only way, the court indicated, that the FPC can deal with rate questions arising under contracts.

The court ruling involved applied directly to an effort by United Gas Pipe Line Co. to get around its contract with Mobile Gas Service Co. *(The Oil and Gas Journal, March 26, page 73).*

In it the court said, in effect, that a contract is an agreement between two parties and can be changed only by action of both. A seller, it said, cannot alter his contract with a buyer merely by filing with the FPC a rate change to which the latter has not agreed.

Equally important, it held that the Natural Gas Act does not give the FPC power to interfere with the operation of contracts. It can only determine whether the contract terms were proper in the first place.

Lawyers busy . . . Gas attorneys quickly seized upon the court ruling as the basis for motions against FPC action to halt price increases by producers under escalation clauses in their contracts. They argued that the principle laid down applied to all contracts—those of producers as well as pipelines.

The FPC's action halted an increase in producers' prices. But gas lawyers are confident that the same principle will stop the commission from interfering with price increases under escalation.

Several investigations of such increases are under way. In some, motions to dismiss have been filed.

Deep Drilling Due

● Humble vice president sees big upswing in deep wells in next 10 years

HOUSTON. — The number of wells annually drilled below 10,000 ft. will take a 90 per cent jump in the next 10 years.

This is the prediction of Carl E. Reistle, Jr., a director and vice president in charge of production for Humble Oil & Refining Co.

Reistle told a meeting of the Gulf Coast section of A.I.M.E. that his company's exploration department has surveyed all areas in which Humble operates, and that includes all deep drilling areas except southern Oklahoma and Wyoming. The results show that only 2,301 wells will be drilled below 10,000 ft. during 1956 in the region surveyed. However, that number is expected to increase to 4,043 in 1965.

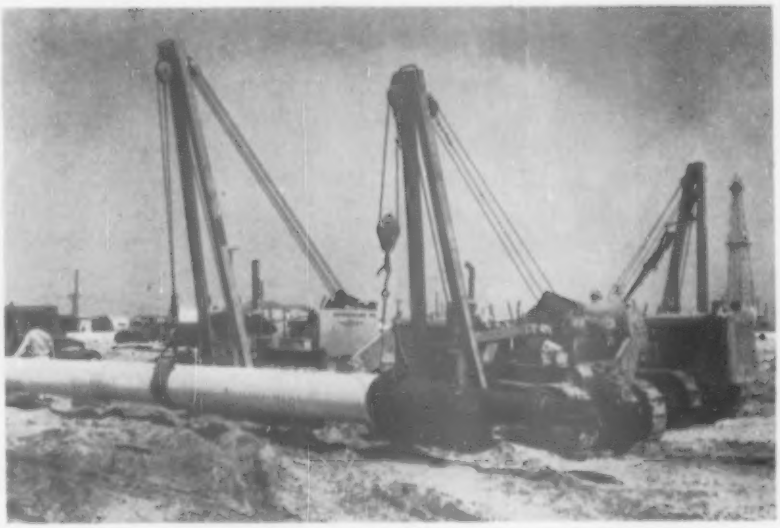
According to Reistle's figures, 40 per cent of those deep wells will be in South Louisiana and the eastern Gulf Coast. Other areas also will see a big increase. The number in California and the Texas Gulf Coast will double; it will quadruple in Southwest Texas.

Reistle says he looks for a sevenfold increase in wells drilled to 16,000 ft. While only 47 are to be drilled that deep this year, some 532 are expected to reach the mark in 1965. Only seven wells will pass 18,000 ft. this year, but there will be 82 in another 10 years.

Deep oil is possibility . . . Reistle admitted that only a small part of our present reserves lies below 10,000 ft. Nevertheless, he contends that there is no reason to condemn marine rocks at any depth as oil reservoirs. The problem of how deep we can drill, he says, is economic and engineering—not geological.

To get at oil below 20,000 ft., Reistle declared that we need big improvements in present equipment and materials. One of the weakest points is tubular goods—drill pipe as well as casing and tubing. Yield strength and ductility must be improved, he said. Moreover, there is no existing cement material that could be used in a well having a bottom-hole temperature above 500° F.

Other equipment such as draw works, drilling line, blocks, muds, logging tools, derricks and masts, blowout preventers, and substructures are already available or should be shortly.



Wilshire Completes Marine Pipeline

HUNTINGTON BEACH, Calif.—Installation of a special nose section on first length of pipe completed preparations for pulling pipe seaward on Wilshire Oil Co.'s new $1,000,000 marine unloading terminal here.

The pipeline was laid in 250-ft. sections which were welded together onshore and then attached to the portion already pulled offshore. The completed line includes 7,000 ft. lying on the ocean floor and 5,000 ft. running from water's edge to a nearby tank farm. The pipe was coated inside with ⅜ in. of concrete to give it a negative bouyancy of 5 lb. per foot. The outside of the line is covered with a 2-in. Somastic coating.

Industry BRIEFS

OXNARD, Calif. — Richfield Oil Corp. 1 Ruggles, the first test to be drilled within the city limits of Oxnard in Ventura County, reportedly encountered "interesting" shows on a recent test of a narrow interval at 8,900 ft. The wildcat is slated to go to 12,500 ft. to test for Sespe sand production, the main source of production in the area to the east and west.

EDMONTON.—The new crude system linking Sturgeon Lake fields of northwestern Alberta to the Trans Mountain pipeline is expected to bring increased production and an additional 80 cents per barrel to producers because of cheaper transportation. Peace River Pipe Line Co., Ltd., has begun operating the new 108-mile line, built at a cost of $7,500,000. The new outlet may result in an increase in production from 6,335 bbl. daily to 9,000 bbl. daily.

ORANGE, Tex.—A drilling tender launched here last week soon will go to work for Llano Drilling Co. in the Gulf of Mexico. The vessel, "Clayton G. Dorn," was built by Levingston Shipbuilding Co. here.

CLEVELAND. — Williams Brothers has resumed work on the 108-mile pipeline which will move a coal slurry from Cadiz to Cleveland. Thirty-five miles of 10-in. was laid before the winter shutdown last December. The pipeline is being constructed for Pittsburgh Consolidated Coal Co.

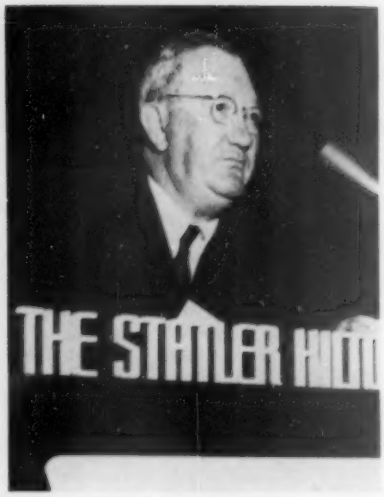
CALGARY. — South Saskatchewan Pipe Line Co. plans to build a 58-mile, 12-in. extension to its crude system from Cantuar field south and west to Dollard field. The company filed an application with the provincial government for the $3,000,000 project.

The line will gather crude from North Premier, Midway, Gull Lake, Bone Creek, and Dollard fields. Construction is expected to start in July and completion is due in September.

BATON ROUGE. — The Louisiana Department of Conservation has published a new map showing 147 oil and gas fields discovered since the last edition in 1953. The wall-size map locates fields, salt domes, pipelines, refineries, natural-gasoline plants, carbon black plants, and offshore blocks.

FRENCH M. ROBERTSON
. . . Costs of meeting FPC demands are killing off small gas producers.

WILLIAM J. MURRAY, JR.
. . . Area gas allocations may be the answer to ratable take of gas.



ARCH ROWAN
. . . Wants a market-demand and ratable-take law for gas.

How Can Gas Producers Live With FPC

DALLAS.—If President Eisenhower's recent veto of the Harris-Fulbright bill cooled off the hot natural gas-regulation question, it was strictly temporary.

Producer clamor for relief from burdensome controls—after a pause for recovery from "veto shock"—is again coming through loud and clear.

Natural gas, mainly federal control and ratable-take issues, nearly pushed everything else off the program at the tenth annual meeting here April 15-17 of the Texas Independent Producers and Royalty Owners Association.

So far as federal controls are concerned, it appears to be the consensus of producers that they are faring even worse under regulation than they had feared.

Costs of trying to comply with Federal Power Commission dictates under the Supreme Court's Phillips decision are strangling many of the smaller producers. Specific instances of this were pointed out during a panel discussion on gas by French M. Robertson, Abilene, Tex., president of the Texas Mid-Continent Oil and Gas Association.

Many independents, Robertson said, are just beginning to grasp the full meaning of the terms "bureaucratic control," "regulatory cost," "red tape," and "absentee regulation."

The direct cost of merely preparing and filing necessary papers and reports is terrific. Robertson said he knew of one operator—and not one of the largest—who spent more than $100,000 in a rate case which was before the commission for about 16 months. This figure included only tangible costs, such as for accountants, clerical help, expert technical and legal advice, and administrative overhead. It did not include the indirect cost of having "some of the best brains of the outfit tied up for long periods of time."

The little fellow simply cannot afford the cost of the skilled technical help necessary to present his case effectively to the commission. He can either let his case go by the boards or sell out to a bigger operator who can afford to absorb the high costs as part of its general overhead, Robertson said.

"If he follows the former course he may get nothing for his efforts or his property. If he follows the latter, he is out of business."

In one rate-increase case only last month, Robertson said, two small gas producers involved failed to show up for the hearing because their stakes in the matter were not big enough to justify the expense of their appearance. These were Trigood Oil Co. and the estate of E. E. Brown.

The primary applicant, Continental Oil Co., asked FPC for permission to withdraw its request for a rate change because it was "unable within the allotted time to prepare the matter so that the commission might have a full understanding of the issues and facts involved."

Along with this, Robertson said, few companies have managed to get what they went after in Washington. One of the few was Wunderlich Development Co. It took Wunderlich 18 months to win FPC approval of a rate increase from the date of application. It will be a long time before the company can make up the money it had to spend to get the increase.

New threat . . . The independent gas producer is presently called upon to furnish a bale of statistics under regulatory powers "supposedly conferred by the Phillips decision," Robertson said.

"Now the FPC has commanded the independent to show cause why he should not be required to furnish the commission with information on intrastate as well as interstate sales."

The agency clearly does not have this authority under the Natural Gas Act or the Phillips decision. It bases its action on grounds that it has found this data "essential" to its administration of the Gas Act, he said.

Thus the independent is required to furnish a bale of statistics on one hand and to defend himself "against a prospective order requiring him to furnish another bale of information on a matter over which the FPC has no jurisdiction whatsoever."

Plan of action? . . . Robertson said he now knew of no crystallized plan of action to push through Congress another bill which would relieve the producers of these burdens. He expects such a plan will be developed only after the elections this fall.

Such a bill, "agonizing as the truth may be, will have to have its support from a broad span of this industry. This should be clear to all of us by now."

Robertson predicted that some of

HUGH Q. BUCK

. . . Ratable gas take might do independents more harm than good.

W. C. WINDSOR

. . . Gas lines let short-sighted self interest outweigh equity, justice.

Controls, Ratable Take?

the pipeline companies might now be "a little more enthusiastic" for legislation freeing producers due to some recent court decisions, one of them the United Gas-Mobile case. (See page 72.)

The Texas Mid-Continent president said he felt producers had gone as far as they could in the way of compromise in the Harris-Fulbright bill. He suggested that it might be well for congressional representatives of the producing areas to oppose anything less desirable in future legislation.

Ratable take aired . . . TIPRO was assured that ratable take of gas is slowly but surely coming by another panel member, William J. Murray, Jr., chairman of the Texas Railroad Commission.

The commission has pledged, Murray said, to work to obtain as nearly as is practical and legal "the same opportunity to all producers of gas in accordance with this allowable as presently occurs in respect to oil production."

The differences between oil and gas operations are not so great as to forbid the same degree of ratable take for both.

It is unlikely, he said, that gas will ever have a great interconnecting gridwork of pipelines as has oil, or that it will ever be possible, for instance, to divert Panhandle gas to Gulf Coast markets.

But there is no reason, he said, why general areas of Texas which are served by a common system of pipelines, that already are or easily could be connected, could not be treated similarly to the way the entire state is now treated in regard to oil.

The potential system aired by Murray before TIPRO was first brought to the attention of the industry by The Oil and Gas Journal *(February 21, 1955, page 83).*

Under such a system, Murray told TIPRO, market demand for gas for such an area could be determined and then equitably allocated to each field in the area. In turn, each field's share of total demand could then be allocated equitably to each well in the field.

"The fact that gas cannot be stored aboveground as can oil and that some pipelines experience extreme variation in load factor would not necessarily prevent ratable take from all wells and fields in a given area. The 6-month over-and-under balancing provision, the underground seasonal storage of gas in areas of high peak demand, and the interconnection of pipelines should make it possible to obtain ratable take without failing to supply fully any bona-fide market demand."

Barriers to ratable take have been erected by man rather than nature, Murray said. As such they can be conquered but not easily or quickly.

Pressure increases . . . Renewed pressure for ratable take of gas was applied by Arch Rowan, Fort Worth, chairman of the TIPRO gas committee, and by W. C. Windsor, East Texas independent producer and royalty owner.

Rowan pulled no punches. He termed gas "the only commodity that fluctuates in price between fields, between owners in the same field, and between states."

"If a bale of cotton sold for half the price in one part of Texas that was being paid for it in another part of the state, and this differential was caused by the acts of a monopoly, the people of Texas would rise up in indignation and wrath, and the attorney general would be in every courthouse in the state trying to stop it."

The next Texas legislature, Rowan charged, should enact market demand and ratable-take statutes for gas similar to those now in effect for oil, plus an antidiscrimination law which would prohibit price and take discrimination between producers in the same field and between fields by the "gas pipeline monopoly."

Windsor also tore into the pipelines. He asked three questions:

. . . Why did the gas companies develop such strenuous opposition to the Texas gas measurement law?

. . . Why has it always taken great pressure to obtain a reasonable royalty under leases they operate?

. . . Why have they opposed ratable take, both in the same field and between fields?

The pipelines, Windsor accused, are permitting short-sighted self-interest to outweigh equity and justice.

Ratable take all good? . . . A fifth panelist, Hugh Q. Buck, Houston attorney, questioned whether independent producers might lose more than they would gain through ratable gas take.

He suggested that independents actually may have been reaping some benefit from federal control in that major firms have been withholding gas reserves from the market whenever possible—thus giving independents markets they might otherwise not have had.

If the Harris bill or an equivalent is passed in the future, he said, this withheld gas will be released. An independent competing on a ratable take basis for available markets at this time might well be squeezed to where he could produce relatively no gas at all.

On the other hand, Buck questioned the ratable take benefit to the independent if easing of federal controls fails to come. Interstate prices would continue to be regulated, and ratable take would have no effect on price.

Competition for intrastate markets can be expected to become fierce, with all large producers with sizable reserves competing for those markets. Ratable take here might well mean that the independent, now filling a comparatively large portion of intrastate pipeline capacity, would have a tough time getting a contract with satisfactory deliverability, Buck said.

It won't cover a crude hike, but . . .

. . . Realization Now at a 2-Year High

John C. Casper

REFINERY realization, although much improved, isn't so great now that refiners could absorb a crude-oil price increase.

If crude should go up, product prices will rise. And a crude increase is generally expected.

Mid-Continent refiners are now receiving more for the products from a barrel of crude than are refiners on the Gulf Coast (See chart). Too, their increase in realization has been greater since the last crude-oil price hike than that of Gulf refiners.

There has been an almost steady rise in Mid-Continent realization since the low point in September 1954, but it hasn't been enough to permit a crude hike without a product-price increase.

For the past 2 years there has been a tendency toward seasonal changes in returns from a barrel of crude, with higher realization during the winter months.

This trend stems from the fact that light heating oil prices drop off more in the summer than do gasoline prices in the winter. Since there is a seasonal change, any comparison of Mid-Continent realization for the first quarter of this year with the summer months of 1954 would tend to overstate the increase.

Also, a comparison of the current average in the Mid-Continent with that of the first quarter of 1953, just before the last crude price increase, also would show an exaggerated gain. The chart indicates that Mid-Continent averages were abnormally low for all of 1952 and the early months of 1953.

The Gulf picture . . . Realization on the Gulf Coast averaged $3.59 a barrel for the 21-month period from September 1951 through May 1953. This average also could be considered normal for the Mid-Continent for the period just before the crude price increase.

Since Mid-Continent realization for the first quarter of this year was $3.95, it represents an increase of $0.36 a barrel over the level considered normal for the period before the last price increase. That price increase amounted to $0.25 a barrel, leaving $0.11 to cover some of the increases in processing costs over the past few years.

Refinery realization on the Gulf Coast averaged about $3.76 a barrel for the first quarter of this year or only $0.17 more than for the period just before crude was raised $0.25 a barrel. The Gulf Coast refiner will need to raise prices enough to cover not only the next crude price increase but also part of the 1953 crude boost.

A major factor in the small increase for Gulf Coast refiners is the compe-

How refinery realization is calculated

Trend totals for refinery realization at Gulf Coast and Mid-Continent refineries are based on yields of the major products and average spot prices published each week in The Oil and Gas Journal.

The yield of gasoline is the net production from crude, excluding any natural gas liquids blended at the refinery. Percentage yields of gasoline, kerosine, and distillate fuels are converted to gallons from a barrel of crude and multiplied by the average price per gallon. For gasoline, the average spot price for regular is used. The average spot quotation for No. 2 fuel is used as the base price for distillate fuels.

All products other than gasoline, kerosine, and distillates are included in the total at the spot residual price for the district.

Each series is designed to show the trend in refinery realization for the district over a period of time. The total for a month may vary from actual realization at a particular refinery or even a group of refineries, but the changes will show distinct trends.

Refinery Realization Trends

GULF COAST—MARCH 1956

	Gasoline	Kerosine	Distillate	Residual and other	Total
Yield (per cent)	42.51	6.59	26.56	24.34	
Gallons per barrel	17.85	2.77	11.16		
Price*	11.125	9.560	9.125	$2.10	
Value	$1.986	$0.265	$1.018	$0.511	$3.780

GULF COAST—MARCH 1955

	Gasoline	Kerosine	Distillate	Residual and other	Total
Yield (per cent)	42.01	7.09	26.42	24.48	
Gallons per barrel	17.64	2.98	11.10		
Price*	11.125	9.625	9.061	$1.975	
Value	$1.962	$0.287	$1.006	$0.483	$3.738
Change	$0.024	—$0.022	$0.012	$0.028	$0.042

MID-CONTINENT—MARCH 1956

	Gasoline	Kerosine	Distillate	Residual and other	Total
Yield (per cent)	50.70	3.67	25.30	20.33	
Gallons per barrel	21.29	1.54	10.63		
Price*	11.250	10.313	9.312	$2.138	
Value	$2.395	$0.159	$0.990	$0.435	$3.979

MID-CONTINENT—MARCH 1955

	Gasoline	Kerosine	Distillate	Residual and other	Total
Yield (per cent)	50.69	3.45	24.00	21.86	
Gallons per barrel	21.29	1.45	10.08		
Price*	10.625	9.633	8.875	$1.550	
Value	$2.262	$0.140	$0.894	$0.339	$3.635
Change	$0.133	$0.019	$0.096	$0.096	$0.344

*Prices in cents per gallon except residual in dollars per barrel.

tition of products produced from imported crude. Except for exports and the small volume of Gulf Coast products moving up the Mississippi River, surplus material from the Gulf refining area moves to the high-demand states on the East Coast.

Keen competition on the East Coast has resulted in a continuing shift to foreign crudes for all of the important refineries in the area. Foreign crude accounted for 50.2 per cent of total East Coast refinery runs in 1952. The ratio climbed steadily to reach 59.4 per cent of runs in 1955.

Realization at inland refineries will follow the general trend line shown for the Mid-Continent district while plants on the Gulf and East Coast will be more in line with the one for the Gulf Coast.

Sources of improvement . . . Product contribution to the realization changes for the districts is shown in the accompanying table. For the period from March 1955 through March 1956, refinery realization for the Mid-Continent increased $0.344.

Note that gasoline accounted for a little better than 13 cents of this total. All of this gain was due to higher prices since percentage yield from crude was practically the same for both months.

Both price and yield of distillate increased to add 9.6 cents to the realization total for this group. The yield was up from 24.0 per cent in 1955 to 25.3 per cent last month. The average price moved up from 8.875 cents a gallon to 9.312 cents.

The average Group 3 price for residual gained enough in the past year to more than offset the decline in yield. The price rose from $1.55 a barrel to $2.138. On the other hand, only 20.33 per cent of the average barrel of crude was turned into heavy fuel last month compared with 21.86 per cent a year ago.

On the Gulf Coast, refiners were getting only 4.2 cents more for the products from a barrel of crude than a year earlier. The small contribution to the gain by gasoline was offset by a loss for kerosine. Total distillate from a barrel of crude was bringing only 1.2 cents more than for March 1955 and part of this small gain was due to higher yields. Residual was selling for 2.8 cents more than last year.

If product markets follow the general pattern of the past 2 years, there will be a slight reduction in average realization during April for both the Gulf Coast and Mid-Continent districts. Gulf Coast cargo quotations for kerosine and No. 2 distillate dropped 0.25 cent a gallon soon after the first of April and some softening has been reported on the Group 3 market.

Labor Peace Seen

Union says plant strikes prompted by local issues

DENVER. — The refining industry generally can expect a peaceful year with its union labor.

Present scattered strikes in widely separated plants are not a pattern of things to come *(The Oil and Gas Journal, April 9, page 78)*.

That's the report from officials of the Oil, Chemical and Atomic Workers International Union here. A union spokesman declared last week all present strikes in refineries involving the O.C.A.W. have resulted from local situations.

The union said the strike at Cities Service Oil Co.'s East Chicago, Ind., plant, for example, arose from a disagreement with management over handling of work assignments and seniority provisions of a new contract. This walkout has forced Cities Service to reduce crude-oil purchases in five states by 55,000 bbl. daily.

The strike at Shell Oil Co.'s new Anacortes, Wash., refinery possibly could have some effect on other plants along the West Coast, but not east of the Rockies.

O.C.A.W. union members are striking at Anacortes for a higher wage increase than the 6 per cent hike offered by Shell. Six per cent was accepted by other locals of the same union in other sections of the nation. But union officials point out that West Coast wage scales have ranged slightly under those paid O.C.A.W. workers in the Great Lakes and Gulf Coast. The Anacortes local is striking for scales equal to those paid in other geographical areas.

Union leaders concede if the men at Anacortes win an increase larger than 6 per cent, workers in other West Coast plants might make the same demands.

Shale Issue Splits Congress

WASHINGTON.—Congress split last week over whether the Bureau of Mines should continue its oil-shale research at Rifle, Colo.

The Senate Appropriations Committee put $1,200,000 back into the Interior Department's money bill which the House had cut out. The fund was asked for continuation of a study of mining shale, to cost $1,000,000, and research at the Laramie, Wyo., laboratory, to cost $200,000.

If the money stays in the bill when it is passed by the Senate, the issue will have to be decided in a conference committee.

TIPRO Acts on Problems

Crude prices, federal controls, imports, and pipelines' practices draw sharp resolutions from independents' group

DALLAS.—Independent oil producers of Texas showed their independence at the tenth annual meeting of the Texas Independent Producers and Royalty Owners Association by initiating a score of actions embodying their own original ideas for solving their problems.

The price of crude oil, continued high imports of foreign oil, federal regulation of gas production, purchasing practices of gas pipelines, and a hatful of state tax and regulatory problems were their chief targets.

For almost every problem they proposed a variety of alternative or concurrent remedies.

As to imports, TIPRO adopted resolutions which:

. . . **Ask Congress** to reject membership in the Organization for Trade Cooperation, to abandon multilateral trade negotiations, and to adopt bilateral tariff bargaining which would exclude imports from "unreliable sources, such as the Middle East."

. . . **Call on the President** either to insist that the Office of Defense Mobilization restrict imports "to a level consistent with national security," or announce that this won't be done "in order that Congress may consider appropriate supplemental action without delay."

. . . **Ask the President** to tell what is being done under the Defense Minerals Act to decrease the dependency on overseas sources of strategic minerals.

. . . **Request defeat** of a pending proposal to decrease taxes on foreign oil investments.

. . . **Demand that** the National Security Council report on the ability of the domestic industry to supply oil for war and on the dependability of Middle East supplies.

. . . **Petition Congress** to begin immediate hearings to determine whether tariffs, quotas, or a combination of both will best protect domestic producers from excessive oil imports.

. . . **Request those senators** who sponsored the defense amendment to the 1955 Trade Agreements Extension Act to demand that the Office of Defense Administration act at once to limit imports to the level recommended by the cabinet committee report.

As to federal regulation of gas production, TIPRO adopted resolutions which:

. . . **Importuned the President** to sponsor legislation to exempt producers from direct control by the Federal Power Commission, in accordance with the principle he endorsed in vetoing the Harris bill.

. . . **Told FPC** that it is exceeding the authority given it under the Phillips decision in attempting to regulate independent producers.

. . . **Directed** its executive committee to seek court clarification of FPC powers over independent gas producers.

. . . **Called on FPC** to prevent the importation of natural gas from foreign countries at prices discriminating against domestic producers now having lower prices.

. . . **Authorized a program** to attract new gas-consuming industries to Texas to decrease the volume of the state's interstate sales.

. . . **Recommended** a sweeping program of legislation including:

1. A new bill, to be sponsored by TIPRO, exempting producers from federal regulation but with terms more favorable to independent producers than the vetoed Harris-Fulbright bill.

2. A new system of regulating interstate gas pipelines by making them common carriers under regulation of the Interstate Commerce Commission, thus permitting producers to sell directly to city distribution companies.

3. A bill to prohibit discrimination by gas purchasers in the purchase of natural gas.

4. Divorcement of gas pipeline companies from all unrelated activities, limiting them to the purchase, transmission, sale, and distribution of gas.

Positions reversed . . . On both imports control and gas prices, TIPRO reversed the positions it took at its annual convention a year ago.

Last year the group strongly endorsed quota restrictions on imported crude oil and petroleum products. This year's report of the imports committee declared that a tariff is the best method of control.

It recommended a duty of 50 per cent of value on crude oil to equalize foreign and domestic producing costs, but found acceptable a combination of tariffs and quotas on a sliding scale, or preferential tariff treatment to oil from the Western Hemisphere.

This year, too, TIPRO completely abandoned the "economic waste" bill which it vigorously espoused before the last session of the Texas legislature as an indirect means of establishing minimum field prices for natural gas. It was explained that this plan now appears to be less practical then when first proposed and that other legislative remedies would make it unnecessary.

Crude prices . . . An immediate increase of not less than 60 cents per barrel in the price of crude was called for by the convention.

A report on crude prices declared that rising costs have eliminated price incentives to develop the new reserves which will be needed to meet predicted demands for petroleum during the next few years.

Hamon asks cooperation . . . A mild chiding on too much independence was given TIPRO by Jake L. Hamon, Dallas independent, charter TIPRO member, and chairman of the American Petroleum Institute.

"Don't insulate yourself by keeping within your own group," Hamon said. If TIPRO intends to operate on a national level he advised that it either open a well-staffed Washington office or participate with other industry associations already operating nationally. He said it is imperative for the future of the industry that producers learn the problems and attitudes of other industry divisions.

This is particularly true in public relations, Hamon said.

"We Texas independent oil producers are damned unpopular everywhere in the United States outside of our own oil patches. . . . They think we are a bunch of rich, overbearing braggarts with a tax gimmick. . . .

"Unless we change that unfair attitude about us we're going to lose our depletion provision, and generally go down the drain. . . . You have got to realize that we are the lousiest public-relations men it is possible to be. We have got to start making friends and influencing people, and we are starting a lot later than we should be."

Hamon called attention to the fact that out of 1,500 volunteer workers in the industry's public-relations program in Texas, only 18 are independent oil producers.

Drumheller Outlet Planned

CALGARY. — Canadian Gulf Oil Co. is planning a 35-mile pipeline to connect Drumheller field, 65 miles northeast of here, with existing Gulf lines running to Edmonton.

The company has already applied for permission to construct the 8-in. line. It would connect with existing lines at Big Valley. If permission is granted, Gulf said, construction will start as soon as pipe can be obtained. Tariff would be 14 cents a barrel to Big Valley and 12 cents from there to Edmonton. Cost of the line was set at $736,000.

Bidding expected high as . . .

. . . Houston Dump Up for Leasing

HOUSTON.—The Houston city council will offer an oil lease April 25 on a city-owned garbage dump near the revitalized Pierce Junction field.

The 300-acre dump is less than a quarter of a mile east of recently established production on the east flank of Pierce Junction salt dome.

Some of the city fathers are hoping for an eventual return of $20,000,000 or more from the oil under the garbage heap. But oil men have cautioned that the city, with luck, may get a few thousands dollars a year in royalties. They say a $1,000,000 return in 20 years probably would be a better estimate.

Knowing the confusing geology of salt domes, these same veteran oil men pointed out that there is always the chance drillers may come up with nothing more remunerative than salt water.

The lease will go to the operator offering the highest cash bonus. In addition to the bonus, the city is demanding 3/16 royalty, of which a third would go to heirs of the former owners of the property who have an interest in the mineral rights.

Wells must be directionally drilled from outside the dump boundaries so that oil operations will not interfere with the city garbage department's primary mission.

High bidding expected . . . Whether or not oil underlies the garbage pile—known officially as the Holmes Road Dump—bidding for the acreage may be unusually high. Owners of some parcels of land nearby reportedly have received 50 per cent royalty for leases.

City officials are hoping to get 30 producers on the 300-acre tract. Terms of the lease will require completions at the rate of one every 90 days.

History of Pierce Junction field dates back almost to the turn of the century. It appeared to be slowly dying until late 1954 when Scurlock Oil Co. completed the 1 H. C. Cain. The well, drilled on the east flank of the old field, produced 141 bbl. of oil per day from 7,103-17 ft.

By the middle of 1955 the field was booming. Eight wells had been completed on the east flank, and most of them were good oilers. Oil men were swarming around the field, which had been drilled and redrilled for half a century.

Last summer Magnolia Petroleum Co. and Stanolind Oil & Gas Co. decided to test the north flank. They acquired leases on a 448-acre tract owned by the Shamrock Hilton Hotel and an adjoining 230-acre tract owned by the Houston Fat Stock Show.

While Glenn McCarthy was looking for oil in Bolivia, Magnolia and Stanolind drilled a well on the Shamrock Hilton property, which McCarthy formerly owned. It produced at the rate of 188 bbl. daily. Early this year the first test on the stock show land was completed for 155 bbl. daily.

During the past month or two there have been more than 20 rigs active in the expanded field. About half of them are working on the north flank and the other half on the east flank of old production. More than 30 producers have been completed in the area since January 1.

Processing BRIEFS

TEXAS CITY.—A 20,000-bbl. crude distillation unit will be built by Republic Oil Refining Co. at its 45,000-bbl. daily Texas City plant. The design and construction contract was awarded to Refinery Engineering Co., Tulsa, which also will build a control room for four processing units. The new tower will use the site and some of the parts of an outmoded thermal cracker, which will be dismantled. It will replace some old units and give the refinery a net gain in capacity.

DALLAS. — Atlantic Refining Co. soon will build a 25 million cubic foot daily absorption gasoline plant in the University of Texas Block 31 field, 5 miles northwest of Crane. The plant will add to existing pressure-maintenance facilities there. Authority to build it came from co-owners Phillips Petroleum Co., Continental Oil Co., and Chicago Corp. Atlantic is operator.

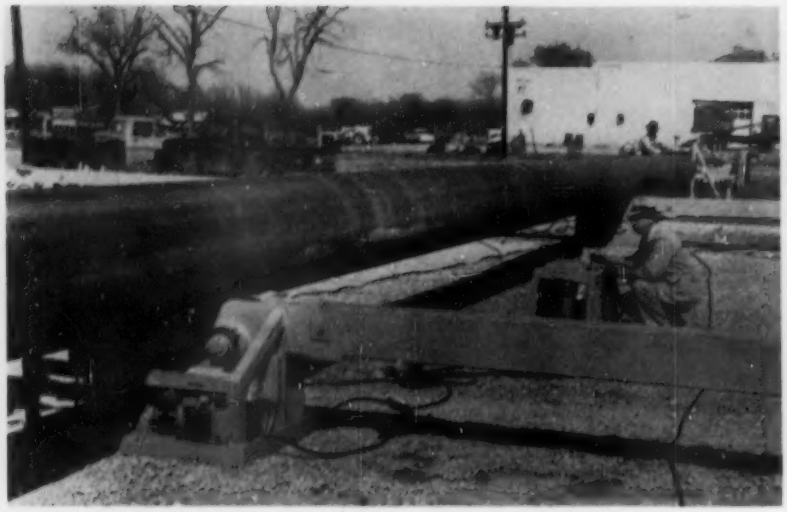
AVONDALE, La.—American Cyanamid Co. is going to make methylstyrene from acetylene and toluene using mercuric sulfate-sulfuric acid catalysis. Spent acid from the new installation being built here will go into fertilizer.

LINDEN, N. J.—Esso Standard Oil Co. is revamping one of the big fluid catalytic cracking units at Bayway refinery to permit more recycling of heavy gas oil for maximizing gasoline yields. The fractionation tower is being converted from 20 to 26 trays and two-stage cyclones are replacing single-stage units in the reactor.

New baffling and more waste heat boiler capacity is being added to the regenerator stack. A new steam drum on the slurry circuit and a new heating oil stripper round out the modification project.

McPHERSON, Kans.—Contract for construction and design of a 1,560-bbl. alkylation unit at the National Cooperative Refinery Association refinery here has been awarded Refinery Engineering Co. The unit will be licensed by Universal Oil Products Co.

ANDREWS, Tex.—Construction will begin immediately on a dehydration plant and 6,750-hp. compressor station in Andrews County for Permian Basin Pipeline Co. Gasoline Plant Construction Corp. of Houston will build the facilities, to be located adjacent to a Phillips Petroleum Co. gasoline plant now under construction. Permian will compress about 25,000,000 cu. ft. daily of residue gas purchased from Phillips.



Welder just pushes a lever to kick out double length . . .

. . . In this new H. C. Price yard setup. It's the . . .

Newest Idea in Double-Jointing

TULSA.—The surest way to cut pipeline construction costs is to speed up the operation of a spread. And the simplest way to do this is to double-joint the pipe to allow more joints to be laid in a day.

The most advanced double-jointing system yet developed was displayed here last week. It was built by M. J. Crose Manufacturing Co., Inc., for H. C. Price Co. and already has been moved to Chancey, near Athens, Ohio. It will be used to double-joint 26-in. pipe for a Tennessee Gas Transmission Co. job.

The system features hydraulically powered pipe-handling and lineup devices, automatic rollers to turn the pipe during welding, and a design which permits it to be assembled or taken apart quickly. Manual welding is used in the operation.

Price expects the new layout to reduce greatly over-all pipe-laying costs. Primary benefit will be an increase in speed of the entire spread, but direct welding costs will be lower since the number of welds made on the right-of-way will be cut in half.

The design . . . Pipe racks, lineup carriages, rolling stations, and controls are package-type for portability.

Pins are used for joining the 20-ft. rack sections, and all electrical and hydraulic connections are either of the plug-in or quick-make type. The entire assembly weighs about 90,000 lb. and can be handled by three trucks. Set-up time is about 5 hours.

Basically the equipment consists of carriages to hold two joints of pipe during lineup and stringer welding, two sets of parallel racks for receiving pipe from lineup carriages, and three rolling stations along each rack to turn the pipe during hot-pass and finish welding.

The lineup equipment consists of a rail-mounted carriage on which two other cars with pipe cradles are mounted. These cars are also wheeled to allow movement on the main carriage. Joints are rolled into the two cradle cars from a storage rack; they are lined up quickly by hydraulic controls, and the stringer bead applied. Internal clamps hold the pipe rigid during this operation.

The doubled joint is then kicked off and moves to a pipe-rolling station where it drops onto rollers. These are driven by a variable-speed motor and start turning automatically as soon as the welder strikes his arc. Relays across the welding machine terminals control this action. A switch in the welder's electrode holder allows him to stop the turning at any time.

Hydraulic jacks at the rolling stations kick the pipe out and on down the rack when welding is ended. The jacks are controlled by a valve near the welding position.

During operation the lineup carriage will stay in front of one rack until that rack is filled with pipe. Then the carriage will be moved in front of the other rack where stringer welding will continue. Speed of applying the stringer weld will allow the one lineup carriage to keep both finish-weld racks busy.

Sinclair, Union Plan Talks

DENVER.—The Oil, Chemical and Atomic Workers International Union has served notice of termination of its contract with Sinclair Oil Corp., effective June 15.

That's the annual expiration date of the Sinclair-O.C.A.W. master agreement, covering 15,000 refinery, production and pipeline workers throughout the country.

Dates and site for negotiations will be agreed soon.

Negotiations are not expected to include general pay increase demands, since the union and company early in March agreed to the standard oil industry raises laid down by O.C.A.W. in its 1956 campaign. Shift differentials included in the campaign become effective automatically June 15 for Sinclair workers.

A spokesman at union headquarters here said "a number of different items will be taken up" in the negotiations.

Major Operators Kick Off Seeligson Unit

DALLAS.—The projected Seeligson unit in Jim Wells County of South Texas was given a big push forward when a large percentage of working-interest operators signed up in Dallas.

Estimates are that unit operation and subsequent pressure maintenance in the 15,000-acre, 700-well pool will hike recovery 30 per cent, or about 77,000,000 bbl. above 256,625,000 bbl. estimated to be recoverable under primary operations.

The unit will include 21 oil zones and 8 gas pools between 4,500 and 6,100 ft. Sun Oil Co., largest participating-interest holder, will be operator.

Shown at the signing ceremony are (clockwise from left at table): S. M. Gladney, Sun Oil; O. K. Holman, Texas Gulf Producing Co.; Robert F. Bryant, Magnolia Petroleum Co.; (obscured man is unidentified); H. W. Campbell, D. W. Forbes, and Roland S. Bond, all of Renwar Oil Corp.; and William J. Craig, Jr., Texas Gulf Producing. Standing at rear are: Jack M. Winn and George A. Burr, Jr., of Sun and Val T. Billups of Renwar.

There are a dozen operators in the Seeligson tracts which are being unitized. Sun, as operator, will seek Texas Railroad Commission approval of the unit when working and royalty interest owners representing 85 per cent of surface acreage sign the agreements. Participating companies not represented in above photo include: Shell Oil Co., Sunray Mid-Continent Oil Co., Sinclair Oil & Gas Co., Richardson Oil Co., Republic Natural Gas Co., The Texas Co., the Richardson-McCarrick interests, and the Ramsey interests.

Louisiana Leasing Defies U.S.

BATON ROUGE. — The Louisiana Mineral Board last week accepted bids of $8,792,900 for oil and gas leases on four offshore tracts which the federal Government claims to be wholly or partly within the United States area.

Included in the disputed zones leased by the state is a 2,500-acre tract which the Interior Department will offer for lease May 15.

In all, the state accepted bids totaling $13,395,907 for 29 tracts covering about 39,950 acres. High bids, averaging more than $300 per acre, totaled nearly $6,000,000 more than had been forecast by state budget officials.

Anderson-Prichard Oil Corp. paid $50,900 for a 2,500-acre lease being offered by the federal Government next month. The disputed tract is the west half of Block 39, East Cameron area.

Who's trespassing? . . . In accepting bids for the four disputed blocks, the Mineral Board openly defied the U. S. Department of Interior. Acting Interior Secretary Clarence A. Davis in a telegram to the state agency, protested the sale.

"Any operations that may be conducted on the outer Continental Shelf as a result of issuance of any leases by the State of Louisiana will be deemed in trespass," he warned.

Davis declared that two tracts offered by the state appeared to be entirely within federal boundaries and that four others appeared to be partly under United States jurisdiction.

Other bids . . . The Texas Co. was high bidder in last week's sale, paying a $6,165,000 bonus for 3,750 acres in Block 11, South Timbalier area. This tract adjoins a block which brought a record bonus of more than $10,000,000 in November. The Interior Department claims it is partly in the federal area.

The Texas Co. also paid $2,656,000 for approximately 1,886 acres in Block 16, South Timbalier area, another tract in dispute. The fourth contested lease went to Shell Oil Co. and The California Co. They submitted a joint bid of $101,000 for 1,875 acres in South Pass area.

Louisiana withdrew one tract near the mouth of the Sabine River at request of Gov. Allen Shivers of Texas. The tract is in the area overlapped by claims of the two states.

Tidelands Delay Charged

SACRAMENTO.—Col. Rufus W. Putnam, executive secretary of the State Lands Commission, last week charged "certain interests" in the oil business are trying to get the state to delay awarding tideland oil and gas drilling concessions.

Putnam told the commission hearing here that the stumbling block appears to be the failure of the industry itself to agree on procedures for awarding leases.

Paul A. Lower, attorney for Superior Oil Co., countered that the industry disagreement was caused by the complexity of the new law.

Louisiana to Cut Allowable

BATON ROUGE. — An estimated cut of 30,000 bbl. daily in Louisiana's oil-production allowable will go into effect in May.

Conservation Commissioner John B. Hussey said the exact allowable will be set at a staff meeting here April 23.

The reduction will be the first in Louisiana since last May. This month's allowable, at a record 788,778 bbl. daily, is more than 125,000 bbl. per day greater than that for June 1955, when the state's current production spiral started.

Hussey said Louisiana's depth bracket formula will be altered to reduce maximum allowables 4 per cent. It is estimated the revision will cut gross production about 45,000 bbl. per day. But new production is estimated at about 15,000 bbl. daily.

Merger Bill Passed

Proposal requires 90-day notification of big deals

WASHINGTON.—Congress is moving to put the brakes on big-time mergers.

The House last week passed a bill requiring that the Federal Trade Commission and Justice Department be given 90 days' notice of proposed mergers of companies with combined assets in excess of $10,000,000.

The waiting period gives the Government time in which to move to stop objectionable mergers. But even if it does not act within the 90 days it is not barred from later proceedings if the merger constitutes a violation of the antitrust laws.

The bill, in addition, gives the FTC the right now held by the Justice Department to seek a preliminary court injunction against a proposed merger.

Debate on the bill disclosed that many mergers have been consummated secretly to get around the prohibitions in the Clayton Act. The government agencies have been able to get little information on such mergers while in the making, preventing any effective effort to halt objectionable combinations.

The bill carries a penalty of from $5,000 to $50,000 for failure to give advance notice.

There is no bar to the purchase by one company of the stock of another for investment up to 5 per cent of the latter's outstanding share capital, nor to the formation of subsidiary corporations with all of the stock held by the parent company.

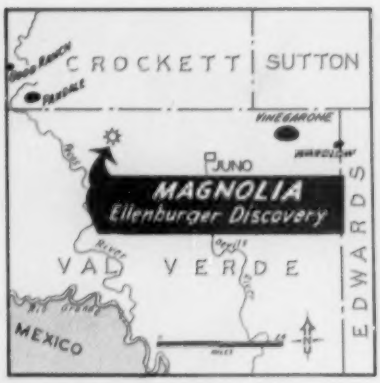
No opposition was expressed to the bill, asked for by the administration. No objection is expected to arise in the Senate, which now must pass on it.

Chemical Plant Completed

AVONDALE, La.—American Cyanamid Co. has completed the nation's first plant for large-scale production of monomethyl styrene.

The plant, which started operations last week, is the first step in a $39,000,000 expansion program at the company's Fortier installation near here. The new unit cost approximately $4,500,000. It will have a capacity of about 30,000,000 lb. per year.

Other expansion planned by American Cyanamid here within the next 5 years includes duplication of many present facilities to double the output of acrylonitrile at a cost of about $25,000,000. Also being considered are new facilities costing about $9,500,000 to produce derivatives of acrylonitrile.



Wildcat Finds Gas

Southwest Texas test is 20 miles from production

OZONA, Tex.—Magnolia Petroleum Co. last week completed a gas well at a remote wildcat location more than 40 miles southwest of here in Texas' far-southwestern and little-explored Val Verde County.

The discovery is more than 30 miles west of the Vinegarone gas area, the county's only other currently productive field, in the northeastern corner of the county.

Nearest production is more than 20 miles northwest in the southwestern corner of Crockett County in Pandale field, where Sun Oil Co. has an isolated gas well, shut in since its completion 3 years ago.

Production of the new discovery well, 1 Morrison, is from the Cambro-Ordovician Ellenburger horizon. This is the farthest-south production from that horizon, the nearest being Sun's shut-in gas well. Vinegarone produces from the much-younger Pennsylvanian-Strawn formation.

Production details . . . Pay in Magnolia's well is in open hole at 14,168-940 ft. and from a casing-perforated zone at 13,944-14,062 ft.

Hole was drilled to 15,143 ft. and plugged back to its present bottom at 14,940 ft. The Strawn formation, productive at Vinegarone at depths of 10,000 to 10,500 ft., was encountered at 12,200 ft. Production, on a 12-hour potential test through ⅜-in. choke, was rated at 1,182,000 cu. ft. per day. Pressure was 375 to 410 psi. on the tubing, and 401 to 442 psi. on the casing.

Geologically, the well is in the Val Verde basin off the south flank of the Central Plains Platform. Location is 22 miles northwest of Juno in a sparsely populated region. It is 4½ miles south of the Crockett County ine.

Navy Claims Title

Wants offshore oil rights around San Nicolas Island

WASHINGTON. — The Navy last week claimed that its ownership of San Nicolas Island off California carries with it title to submerged oil in the surrounding 3-mile marginal sea.

The department's claim, which inferentially extends to the submerged resources off all Government-owned coastal areas, was contained in a letter and memorandum sent by Undersecretary Thomas S. Gates, Jr., to Rep. Harry S. Sheppard of California.

Sheppard is chairman of the House Navy Appropriations Committee, which is considering the Navy Department's request for $529,000 to test the oil possibilities of the island.

Navy is seeking to develop a new petroleum reserve of 100,000,000 bbl. or more on the West Coast, Gates said. But he firmly squelched rumors that any reserve is planned for the Gulf of Mexico's outer continental shelf.

The rumors, he said flatly, are not true. He added they grew out of a Navy investigation of the area in connection with studies of possible missile-testing sites and overwater bombing ranges.

The memorandum said there appears to be no controversy over ownership of the natural resources of San Nicolas Island. But a "more difficult problem" arises in connection with the natural resources under the island's 3-mile belt.

Navy contends that ownership of the natural resources in the territorial belt is vested in the United States by virtue of the Submerged Lands Act of 1953.

Gates said it is unlikely that private industry would be willing to explore the area for oil "unless it were permitted to produce what it found."

This would be prohibited, he said, by Navy's policy of stockpiling oil in the ground for emergency use. But this policy, he continued, would also prevent competition by the Navy with private industry.

Canada Seeking Oil Data

OTTAWA.—The Gordon Commission is taking a new tack in its efforts to find out how much of Canada's oil industry is controlled by foreign interests. Queries are being sent direct to individual oil companies.

Earlier attempts to gain this and other data on operations met with reluctance. Companies feared the information would fall into hands of competitors. Now the commission has assured them it will be "held in strict confidence."

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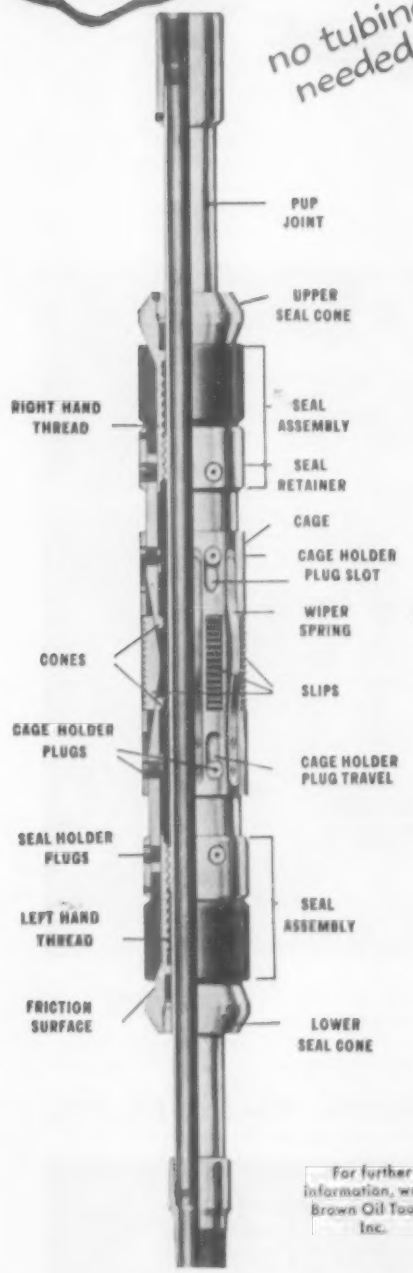

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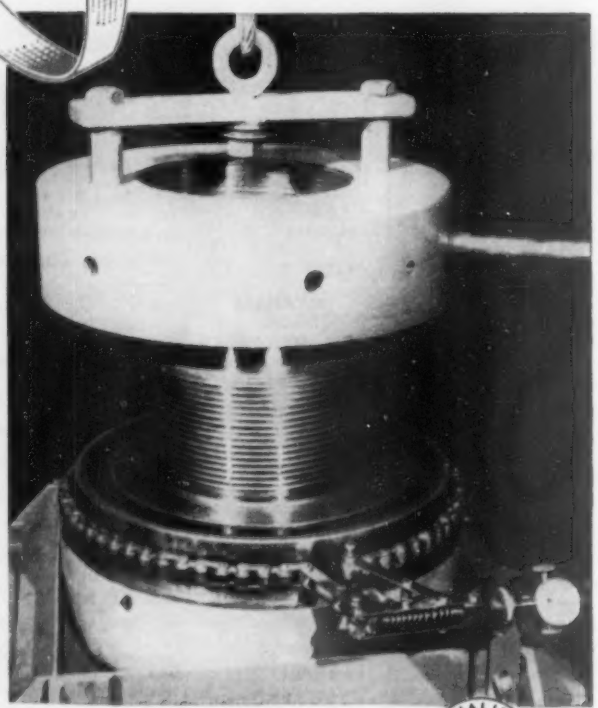

OF COURSE the parties involved had been going around together for some time—in fact, ever since they met in the Open Hearth—but it took the "ring test" to finally prove their mettle.

A perfect union of chemical components carefully controlled to make a steel of the required outstanding physical properties necessary to produce Line Pipe worthy of the name "YOUNGSTOWN".

The "ring test", pictured at the right, is the last of many rigorous tests used to prove the quality of Youngstown Electric Weld Line Pipe. A three inch section, or ring, of finished pipe is telescoped over the rubber gasket of the testing machine, and hydraulic pressure applied to determine the TRUE yield strength.

A TRUE test result due to the fact that the physical properties of the specimen ring have not been changed by cold working to flatten. Furthermore, the ring test closely simulates service conditions of installed pipe lines. Yes, final proof of outstanding quality and extended service.

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Court appeal may follow as . . .

. . . End-Uses Ruling Challenged

WASHINGTON. — Federal Power Commission control of end uses of natural gas is a step closer to the courts this week.

A petition for rehearing on the FPC's denial of a certificate to furnish gas to a generating plant of Northern States Power Co. has been filed by Northern Natural Gas Co.

If the rehearing is denied or the original decision affirmed, the gas company is expected to appeal to the courts. If the FPC reverses its stand, it is likely that the coal or other interests fighting the application will appeal.

The FPC's denial of the application was based on two grounds. One was that of conservation, holding that the use of gas as boiler fuel is "inferior usage" permissible only under exceptional circumstances. The other was the proposed sale would not bring revenue sufficient to cover costs.

Two members of the FPC supported the denial on the conservation ground. Chairman Jerome K. Kuykendall concurred on the cost argument. He did not agree with the plea for conservation. But his concurrence provided the decisive vote and made conservation a live issue *(The Oil and Gas Journal, March 26, page 76)*.

In its request for review, Northern Natural challenged the authority of the commission to deal with rates or revenues in direct industrial sales. It also vigorously questioned the classification of power generation as an inferior use.

Generation of electricity is the highest known use to which fuels may be put, the company asserted. The use of gas for that purpose is on a par with its use for space heating.

Congress so far has resisted all suggestions to restrict the public's free choice of fuels, the FPC was reminded. It also has recognized that conservation of gas is properly a matter for the states.

"It is gross error for the commission in this case to attempt to accomplish indirectly what Congress has refused to permit the commission to do by direct mandate," Northern Natural's brief declared.

The company argued that it has ample supply to meet its average daily and annual needs, including the sale in question, over the next 15 years. If industrial sales are barred, costs of moving gas for domestic uses would be increased to "prohibitive" levels, it said.

Northern Natural charged that the coal and railroad interests raise the conservation issue "to obstruct the use of natural gas."

"If under the guise of a concern for conservation they can persuade Congress or this commission to eliminate off-peak, interruptible, industrial pipeline sales, they will have won their entire competitive battle," it declared.

Little-Inch Conversion Still up in Air

WASHINGTON.—The Federal Power Commission last week told Texas Eastern Transmission Corp. to proceed "at its own risk" with operation of its "substitute Little Inch" natural-gas line.

But the Commission's temporary authorization specifically forbids Texas Eastern proposed conversion of the Little Inch facilities to handle products.

The new 30-in. line runs 377 miles from near Beaumont to Kosciusko, Miss., where it ties in with the firm's existing 30-in. system extending northward into Pennsylvania. Texas Eastern proposed to switch 200 million cubic feet daily of transmission capacity from Little Inch to the new line. The move would free the Little Inch for products handling *(The Oil and Gas Journal, November 7, 1955, page 76)*.

The Commission last June gave Texas Eastern the green light on the new construction and conversion. But on March 8 the Federal Circuit Court of Appeals set aside the FPC order. The court ordered further study on the ground that loss of products traffic on the Mississippi and Ohio Rivers might force barge operators to reduce "national emergency transportation facilities." Another contention was that Texas Eastern would be able to make up products-revenue losses by forcing higher prices on ultimate gas consumers.

Meanwhile, Texas Eastern completed and put into service the new line, and abandoned part of the Little Inch facilities. The court's order left the firm faced with the prospect of not being able to serve customers with the 30-in. line.

FPC based its latest action on what Texas Eastern called an "emergency" market situation. Due to reduced capacity on the Little Inch facility, the company said, it could not maintain adequate service to its customers without the "substitute line."

But the Commission warned Texas Eastern that the action should not be construed as "any assurance that, after rehearing, a permanent certificate would be granted."

Alaska Land Sought

Colorado firm negotiating with Yakutat leaseholders

ANCHORAGE.—A new Colorado Oil & Gas Co. development contract involving 1,250,000 acres in southeast Alaska is rapidly taking shape. The land lies between Cape Fairweather and Dry Bay in the Yakutat region.

The Denver firm is signing contracts with nearly 300 leaseholders in Fairbanks, Anchorage, Juneau, Seattle, Tacoma, and Washington, D. C. The company expects to submit a development contract for Secretary of Interior approval by June 1, 1956.

Under the operating agreement, individual lessees will share benefits with the Yakutat Development Co. of Washington, D. C., and Yakutat Indians.

The proposal . . . The proposal includes a $1,050,000 bonus, a 5 per cent overriding royalty, and 12½ per cent of net profits from production. Yakutat Development and the lessees will take 45 per cent each. The Indians will get 10 per cent, under terms of an earlier contract with the development company.

Colorado Oil & Gas has placed $300,000 of the bonus in escrow. It will be divided when 85 per cent of the leases have been issued and the Secretary of Interior has signed the development contract.

More than half the 470 leases involved have already been issued by the Anchorage Land Office. The rest are expected to be issued by May.

The land lies just south and adjacent to a similar block awarded to Phillips Petroleum Co. in 1953. Phillips has completed two tests and is drilling its third on the 1,065,884 acres under its control.

Predictions are that if the Colorado Oil & Gas deal goes through, similar land concessions will be sought in Alaska by other operators.

Plans now call for the company to start this summer on a 2-year initial exploration program. Geologists are in the area preparing for seismic work.

The Alaskan program is part of a Colorado Oil & Gas plan to spend $3,500,000 on new exploration in 1956. An additional $3,700,000 is earmarked for development wells.

Airlines Eying Jet Fuel

Kerosine looks like a favorite over JP-4; demand for big volume building up, but price to be an important factor

NEW YORK.—Refiners can look for a swiftly growing demand for aviation jet fuels on a volume basis when the airlines start taking delivery on their new jet planes. But their customers are going to be extremely price-conscious.

Since sufficient stocks of both JP-4 and kerosine will be available for this growing demand, a brisk competitive situation seems shaping up in commercial jet fuel.

The demand picture now indicates a commercial jet-fuel consumption of nearly 1,000,000 bbl. a day within 6 or 7 years.

The airlines are not yet at the point where they must make firm contracts for one or the other type, and they are using the time remaining to study all aspects of kerosine vs. JP-4. From the tone of the recent panel discussion on "Fuels and Fuel Systems for Turbine Transports" at the Society of Automotive Engineers' National Aeronautical meeting here, most parties involved are thinking in terms of kerosine.

The fuel session brought together the aircraft manufacturers, the refiners, and the airlines. All are concerned with obtaining a reasonable world-wide standard of specifications for commercial jet fuel. The consensus favored avoiding too many limitations in such specifications, but most seemed conscious of the freezing-point figure.

In deferring the final decisions on standards to the A.S.T.M., panel members generally agreed in asking for a specification of as broad a nature as possible, not necessarily limited by the demands of "tender" engines. This preoccupation with a liberal set of rules on jet fuels is prompted by the sure knowledge that stringent limits set by users will increase processing cost and price.

The tally . . . While the count on total turbo-props and jets changes weekly, the current tally shows 696 planes of both types operating or on firm order for U. S. and foreign commercial airlines. Of this total, 342 will operate in this country. Turboprops number 472, while 224 are pure-jet craft.

A breakdown by manufacturers shows the following: Vickers Viscount, 290; Lockheed Electra, 119; Douglas DC-8, 107; Boeing 707, 84; Bristol Brittania, 39; Vickers Vanguard, 20; De Havilland Comet, 19; French Caravelle, 12, and Fokker F-27, 4. These do not include options, contracts by non-airlines, or the Comet I models taken out of operation.

As these craft are delivered to airlines over the next several years, the growing demand for jet fuel can be estimated with some accuracy. Although the figure will probably be upped before that date, it now appears that in 1962, total jet-fuel demand from commercial airlines in the U. S. alone will run at least 800,000 bbl. per day.

This will represent an important item in the airlines' operating picture. One airline representative illustrated the higher fuel consumption with jets by citing the example of average operation at a 65 per cent load factor. With current piston-engine craft they get 28 passenger-miles per gallon of avgas. But with the new jets they have on order, they expect to average 15 to 16 passenger-miles per gallon.

High cost factor . . . Another airline spokesman expressed it in dollars. Over the expected life of the new jet planes his company has on order, he estimated that $8,000,000 would be spent for fuel as compared with $5,000,000 for the plane itself. The company anticipates a net profit of $4,000,000 on the plane's lifetime operation. This is just half the fuel bill.

The cost per gallon will loom twice as important with jet fuels. A 1-cent increase would boost the fuel bill of a 30-plane fleet roughly $600 per flying hour, and add $1,750,000 to the year's operating costs. This would represent a 2.4 per cent increase in total outlay.

These critical cost estimates illustrate why airlines are anxious to have a reasonable specification written for commercial jet fuel. The freezing point is an example. Most thinking today settles on a —40° F. limit for jet fuel. If the limit were extended to —45° F. it would mean that additional lighter fractions would have to be blended with kerosine and that would boost the price.

The airlines will be watching smoke-point restrictions with the same eagle eye. While users, refiners and aircraft manufacturers are aware of the necessity for limits, they want a specification which will not reduce availability, and which will still satisfy airport managers.

Freezing point in the —40° F. range will eliminate some domestic kerosines, but lowering it to —50° F. would more seriously limit the quantity available in many parts of the U. S. Most refiners will be able to meet a 25-mm. smoke-point requirement, provided it is coupled with an alternate limit on high-boiling aromatics.

Restrictions loom . . . The 40°-48° A.P.I. gravity range might prove limiting in some foreign markets, but a 12° spread which is under discussion would satisfy all concerned.

Other restrictions loom down the line. Water content of fuel may prove troublesome, although it is felt that it can be kept to a minimum by careful fuel handling.

Still further in the future is the matter of thermal stability. In supersonic military jets, fuel supply is used as a heat sink to cool plane components. A present problem, lack of fuel to satisfactorily withstand high temperatures, may become important to commercial craft as they pick up speed in the years to come.

The debate on JP-4 vs. kerosine continues. Kerosine is considered safer under some conditions and has a higher B.t.u. content. Most craft will use either fuel, and the decision to burn one or the other will largely depend on the relative cost, availability, efficiency, and safety factors outlined in each individual contract closed in the next few years.

U.O.P. Reveals New Isomerization Process

CHICAGO.—A new isomerization process — Penex — was announced last week by Universal Oil Products Co.

The process is aimed at making isopentane and isohexanes from n-pentane and n-hexanes.

Penex uses a fixed-bed platinum-containing catalyst. It is a continuous process and does not require catalyst regeneration.

The process will upgrade natural gasoline and refinery naphthas to make a high-octane product with a good yield and no appreciable loss of byproducts.

Another new refining development—a new hydroisomerization process—is expected to be unveiled by another company next week. Little information is available yet, but it promises good equilibrium results in isomerizing not only normal pentane and hexane but heptane as well. Results on once-through and recycle operations also are reported good.

No leakage, no sticking with this Crane valve after 2 years on heavy alkylate at 300° F.

THE CASE HISTORY—How do Crane cast steel gate valves hold up on heavy alkylate? The No. 47X 10-inch, 150-pound valve you see above has been in service at Eastern States Petroleum Co. refinery at Houston for over two years.

It handles re-run bottoms from the H_2SO_4 alkylation unit at 300° F. In addition to erosion from solid carbon, there is mild corrosion present from acid. Valve operation is on an average of once every 1½ weeks.

Not once has Eastern States had to put a wrench on this Crane valve. There has been no leakage, no sticking whatsoever. Closure is tight and sure, and response to the handwheel is as smooth and easy as the day the valve was installed.

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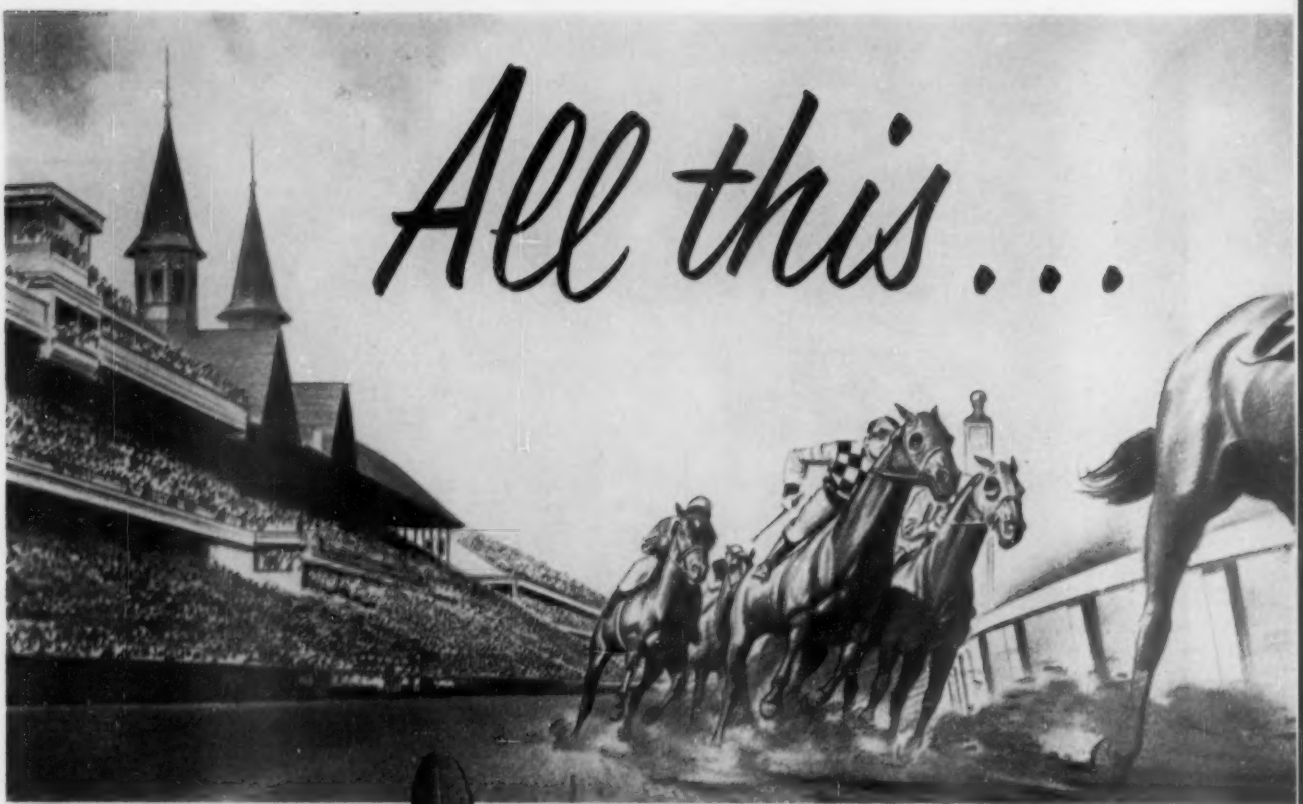

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Illinois — Butler Airplane Sales, Chicago

Indiana — Roscoe Turner Aeronautical Corp., Indianapolis

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Kansas — Aircrafters, Inc., Wichita; Topeka Aircraft Sales & Service, Topeka

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New Jersey — Atlantic Aviation Corp., Teterboro

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Virginia — Piedmont Aviation, Inc., Norfolk

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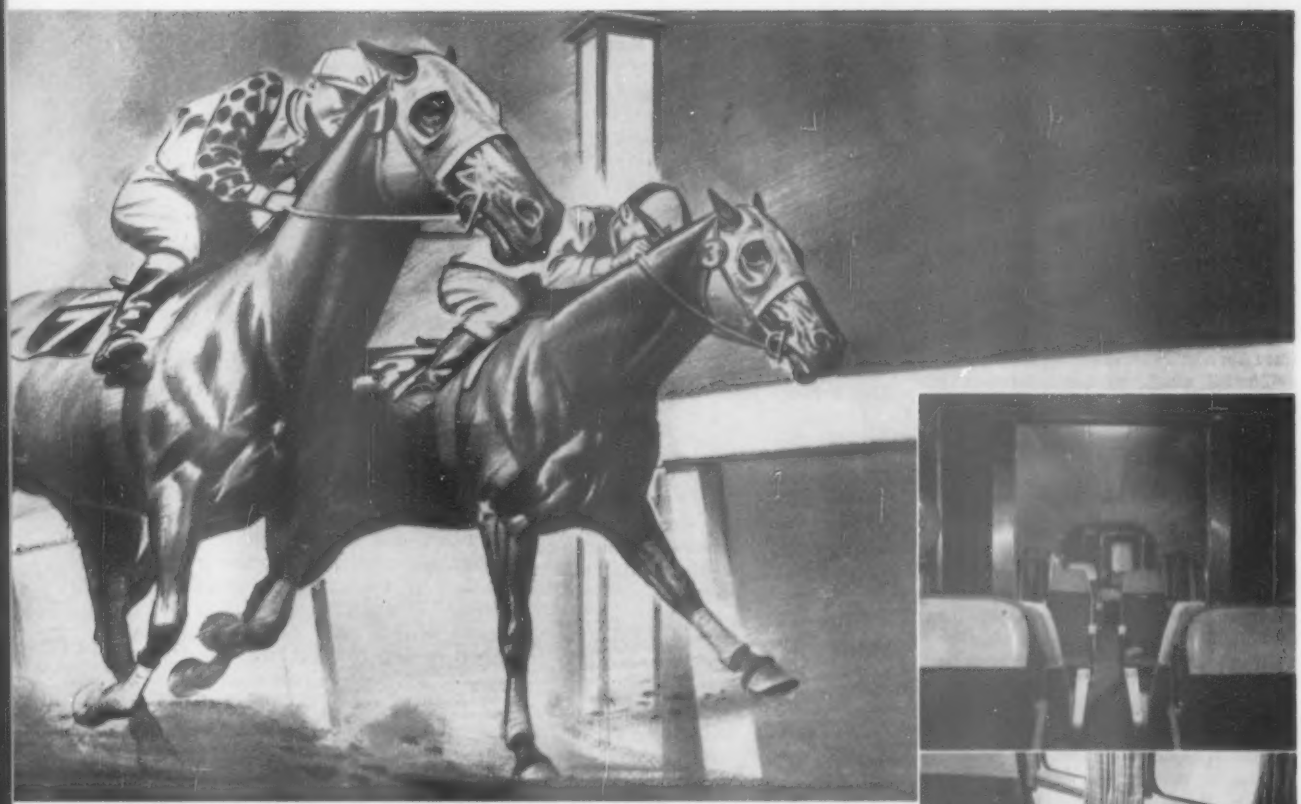

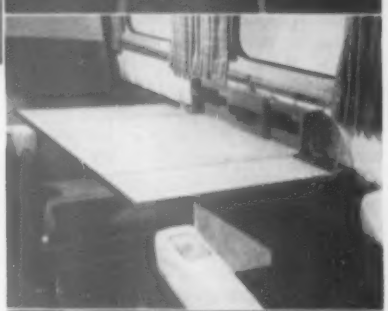

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Unitization Vote Set

Controversial California bill wins place on ballot

SACRAMENTO. — California's controversial oil and gas conservation law, which provides for unitization through majority vote, moved a big step closer to reality last week.

Nominating petitions containing close to half a million signatures, well over the required 322,000-plus, were filed to qualify the proposed referendum for the November election.

The bill would permit unit operation, on approval of a state-appointed committee, when 75 per cent of the operating and royalty interests within a pool agree it is "reasonably necessary" to carry out pressure-maintenance, or secondary recovery operations *(The Oil and Gas Journal, April 16, page 122).*

Opposition forces, led by Union Oil Co., are fighting the proposal on grounds it would bring on needless state control and forced unitization.

In a statement which accompanied the petitions, backers of the measure declared the legislation is necessary to permit "responsible men in the industry" to prolong production.

"Just as men in the field of medical science have found the means for greatly lengthening the human span," the statement read, "scientists in the oil industry have found the means for prolonging the productive life of our great pools and vastly increasing our recoverable oil reserves. All that is needed now is enabling legislation."

The statement was signed by Charles S. Jones, chairman of the California Oil and Conservation Committee and president of Richfield Oil Corp., which drew up the measure.

Other signers were T. S. Petersen, president of Standard Oil Co. of California; Edwin Pauley, Los Angeles independent; D. T. Staples, president of Tide-Water Associated Oil Co.; S. F. Bowlby, vice president of Shell Oil Co.; P. S. Magruder, executive vice president of General Petroleum Corp.; James T. Wood, Jr., vice president of Continental Oil Co.; and George Sowards, western division manager of Ohio Oil Co.

Phillips Wins Round

HOUSTON.—Phillips Petroleum Co. last week cleared one legal barrier threatening to block development of a huge petrochemical center on the Houston Ship Channel.

Dismissed as a defendant in an injunction suit, Phillips planned to begin immediate construction of a spur rail line serving the area. A temporary injunction sought by Texas & New Orleans Railroad Co. had been granted by U. S. District Judge Allen B. Hannay.

The T. & N. O., an affiliate of Southern Pacific Lines, claims the right to serve the proposed industrial area, where Celanese Corp. will erect a plant to manufacture polyolefin resin.

Celanese and five other railroads were named co-defendants in the suit. Although Phillips is now free to build a private spur connecting its industrial site with the Port Terminal Railroad line, it remains to be decided who will operate the system. The case has been set tentatively for trial before U. S. District Judge James V. Allred May 21.

Alkylation Units Amortized

WASHINGTON.—Four more certificates of necessity have been granted by Office of Defense Mobilization granting rapid amortization for the full cost of new alkylation facilities.

Phillips Petroleum Co. received a certificate on a $8,809,000 project at Sweeny, Tex., of which $1,123,000 for additional alkylation capacity will receive 100 per cent rapid amortization. At Sugar Creek, Mo., Standard Oil Co. (Ind.), is building a 5,800-bbl. per day alkylation unit costing an estimated $3,500,000 in an over-all project totaling $5,994,000. National Cooperative Refinery Association has a certificate for amortizing $1,400,000 being spent on a 1,550-bbl. alkylation unit at McPherson, Kans.

The fourth new unit will be installed by Cities Service Oil Co. at Ponca City, Okla. Full cost of the $2,345,000 alkylation facilities is allowed for rapid amortization. Other new facilities covered in the certificate, include additions to crude, vacuum, and fluid catalytic capacity and a new Rexformer, all costing $6,569,000.

Long-Term Storage Sought

WASHINGTON.—Independent refiners last week saw expanded opportunities for government contracts in the Defense Department's long-term storage program.

The military construction bill now before Congress carries a provision permitting the department to make long-term leases for storage of oil products in dispersed areas. Present law limits leases to 1 year.

Because of the lease limitation, the department has found it difficult to get the industry to build expensive storage facilities outside the normal commercial areas. As a result, the House armed services committee said in its report on the bill, a large percentage of military reserve stocks, particularly aviation gasoline and jet fuel, is located in highly vulnerable areas.

The bill would permit the Defense Department to lease storage facilities for a 5-year period. The leases could be extended for similar periods to a total of 20 years. The department also could put in an option to purchase the facility at the end of the contract.

Isomer Tips Given

Pure researchers tell NPC prospects for future uses

CLEVELAND.—The isomers are getting a lot of attention among refiners who are looking at high-octane fuels of the future. Isomerized light hydrocarbons blended with reformate and cat cracked stocks boost road-octane ratings and give an important plus in gasoline antiknock quality where it counts.

Just what effect these branched paraffins have on research, motor, and road octanes was indicated here last week at the fifty-third semiannual meeting of National Petroleum Association. A progress report on "Road Performance of New Gasoline Components" by F. T. Finnigan and A. W. Percy of Pure Oil Co.'s research and development division stressed the value of these isomers.

In a well-documented preliminary report on Pure's evaluation program, the results of testing seven makes of cars on various blends gave the industry some new data for blending to greatest advantage.

Gasoline blends of three levels (95, 97.5, and 100 research octane) were made up from base stocks comprising fluid catalytic stocks, catalytic reformate split into low and high-octane fractions, straightrun naphtha, and an isomerized 200° F. end point straightrun gasoline produced by Pure in a laboratory process. The latter, which included some C_7 as well as C_6 and C_5 isomerate, showed interesting results. For example, an isomerate-reformate blend gave superior road-octane performance. In many cases this type of blend in the 97.5 research-octane class rated higher on the road than some 100-octane blends containing high concentrations of cat-cracked and reformed stocks.

Pure found, however, that a minimum of 25-35 per cent aromatics plus olefins is apparently desirable to avoid depreciation at low-speed, full-throttle conditions.

If engine design trends continue as now indicated, refiners should gain added benefits at the present octane level and that of 100-plus by using combinations of alkylate and isomerate, or alkylate and straightrun with their cracked and reformed stocks.

Deepest WAPET Test Dry

Company schedules new structure-drilling program after fresh disappointment at 15,188-ft. Cape Range wildcat

CAPE RANGE 2, Australia's deepest well to date, has been abandoned as a dry hole.

West Australian Petroleum Pty., Ltd., said it was plugging and abandoning the well last week. At the same time WAPET announced an extensive structure drilling program for the rest of the year, revising previous plans.

P. F. Le Fevre, WAPET's managing director, made the announcement after a board meeting in Perth. Caltex owns 80 per cent of WAPET and Ampol Exploration, Ltd., an Australian firm, owns 20 per cent.

WAPET's only wildcat now drilling is Frazer River 1 on the Dampier Peninsula of northwestern Australia between Broome and Derby in the Fitzroy basin. The well is nearly 700 miles east and north of the Exmouth Gulf area where the company's Rough Range discovery was made. The two Cape Range wells are in the same general area.

The Frazer River test was spudded in December. Last week it was drilling below 6,200 ft. after the crew lost 250 ft. of drill string in the hole below 5,900 ft. and had to sidetrack. The test is to the north and west of the company's Grant Range well abandoned at 12,915 ft. last October.

WAPET abandoned the second Cape Range test after drilling to total depth of 15,188 ft. It is probably the deepest hole drilled in the Southern Hemisphere.

The company decided to pull casing and plug the hole after tests of gas shows in a Jurassic section from 9,886 to 10,098 ft. proved disappointing (*The Oil and Gas Journal, February 6, page 77*). The well tested an initial flow of 40,000 cu. ft. of gas an hour through a ¼-in. choke, but the flow dropped to less than 2,000 cu. ft. an hour at the time the well was shut in.

Cape Range 2 was the last in a series of disappointing wells since WAPET's Rough Range 1 fired Australia with oil fever in December 1953. Eight subsequent tests in the area all proved to be unproductive. Because of mechanical troubles in Rough Range 1, the company drilled a 30-ft. stepout, 1A, to the productive Birdsong sandstone at 3,600 ft. The well produced about 400 bbl. of oil daily through a ¼-in. choke, but water encroachment became more pronounced as the tests proceeded.

Structure drilling . . . The new structure-drilling program announced by WAPET is described as "flexible." The company can alter it to meet any conditions prompted by new information. The company's directors said they are determined to use every available tool of oil exploration in an effort to find commercial oil.

The program calls for a total of 48,000 ft. of hole, most of it, or about 24 exploratory holes, to be in the Exmouth Gulf area.

The structure holes will be located to supplement the geological and geophysical work being done by a seismic crew that will continue its survey. Eight 1,500-ft. holes will be spaced along the southern extension of the Rough Range structure and two 4,000-ft. wells will be drilled on the basis of the data obtained.

Other areas . . . At Dirk Hartog Island, some 250 miles south of the Exmouth Gulf area, the structure-drilling program under way will be extended.

The plans call for drilling six more 1,000-ft. holes with a Failing 1500 rig. As soon as they are completed, four 1,500-ft. holes will be drilled inland from Dirk Hartog between Carnarvon and Shark Bay.

In the Kimberley district of the Fitzroy basin, three gravity-meter crews and two seismic crews will continue geophysical surveys for the remainder of 1956. In addition to the deep Frazer River test now under way, the company plans to drill two 4,000-ft. structure holes in the basin.

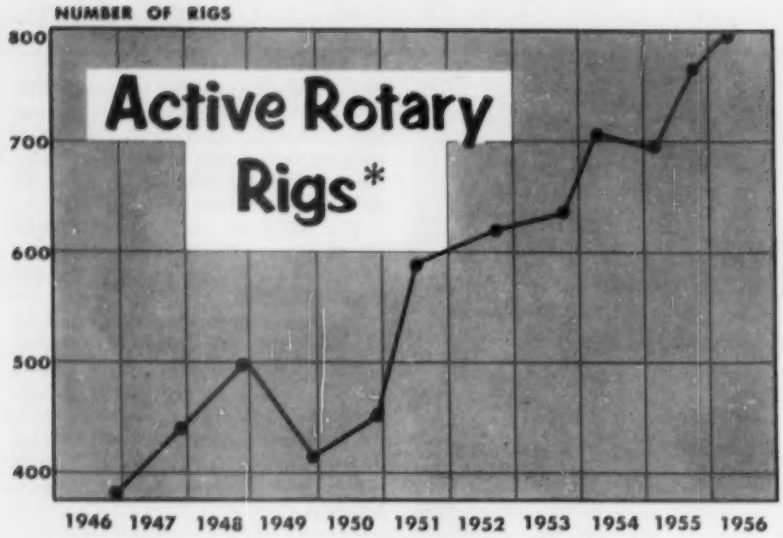
Sun test . . . Sun Oil Co. of California will drill a wildcat this year near the railway station of Fernless, about 200 miles west of Rockhampton in Eastern Australia.

The test will be made under an agreement between Sun and Kimberley Oil Exploration Syndicate, Ltd. The structure to be drilled is 8 miles long and 3 miles wide.

Bolivian-Peruvian Deal Made

The Bolivian government company, Yacimientos Petroliferos Fiscales Bolivianos, has completed an agreement to ship 8,178 bbl. of gasoline monthly to Peru, starting about July 1. The gasoline will be shipped from the terminal of the new Cochabamba-Oruro-La Paz pipeline across Lake Titicaca to the Peruvian port of Puno. It will be marketed by International Petroleum Co. of Peru, which will pay for the shipments in free dollars.

Bolivia, which produces and refines more oil than it consumes, earlier completed export deals with Argentina, Chile, Brazil, and Paraguay.



* Outside U. S., Canada, and Communist-controlled countries.

Foreign Drilling Going Up

NEW discoveries and growing world demand have spurred foreign drilling to the highest level in history.

There were 795 rotary rigs operating in non-Communist countries, exclusive of Canada and the United States, during March. This is more than 4 per cent above last September when 761 were running.

Up-to-date reports are not available from a few foreign areas. But the latest figures point to a continuation of the upward trend in exploration and development drilling that started after the temporary slump in 1949.

With the 2,643 rigs active in the U. S. and 190 in Western Canada, the total for the free world is 3,628.

Why more rigs? . . . There are several reasons for the greater number of active rigs. The more important ones are:

. . . Intensified drilling near new discoveries.

. . . Drive to increase reserves in the face of rising demand.

. . . Need of governments to save on foreign exchange by increasing domestic production, however small.

Since the Heletz discovery last September, the operating rigs in Israel have tripled from 4 to 12.

In Cuba, there are 12 rigs running compared with 6 a year ago. The actual drilling resulting from the 1954 Jatibonico discovery has been rather slow in developing. But the $25 million committed for exploration in Cuba insures greater activity later on.

The Nova Olinda strike in March 1955 touched off the current drilling in Brazil's Middle Amazon. The government oil corporation, Petrobras, plans 9 of its 31 exploratory tests this year for the Amazon region. These nine wildcats will cost around $5,200,000.

Another promising discovery, particularly in a new province, would set off a similar flurry of drilling.

Upward trend to continue . . . All signs point to still greater activity in the future.

New concessions have been granted recently by several countries. Others have either opened their land to applications or are planning such moves. This means that several new wildcats will be spudded within a few months.

Standard-Vacuum Oil Co., Inc., and Hunt International Petroleum Co. have shipped rigs to West Pakistan. A subsidiary of Texas Gulf Producing Co., Houston, has shipped a rig to Libya. Sinclair Somal Corp. will start drilling in Somalia around mid-year, provided the rig can be landed on the East African coast before the monsoon season begins.

Cities Service Co. has begun exploratory work in Colombia in a joint venture with the government company,

Rotary Rigs Outside the U. S. and Canada

(Excluding Communist-Controlled Areas)

Country—	March 1956	Sept. 1955	Feb. 1955
North America			
Alaska	5	5	3
British Honduras	1	1	0
Costa Rica	1	1	1
Cuba	12	9	6
Haiti	1	1	0
Mexico	88	76	75
Total	108	93	85
South America			
Argentina	48	48	48
Barbados	1	1	1
Bolivia	8	4	7
Brazil	28	28	9
Chile	5	5	5
Colombia	22	21	19
Ecuador	10	10	7
Peru	21	21	18
Trinidad	26	30	28
Uruguay	1	1	0
Venezuela	100	120	104
(Eastern & Cent.)	(60)	(69)	(53)
(Western)	(40)	(51)	(51)
Total	270	289	246
Western Europe			
Austria	32	32	*
British Isles	9	6	6
France	29	26	26
West Germany	106	106	127
Italy	40	30	30
Netherlands	8	8	6
Portugal	2	2	2
Spain	3	3	3
Total	229	213	200
Africa			
Algeria	14	9	9
Angola	1	1	1
Egypt	8	7	5
Madagascar	1	1	1
Fr. Equatorial Africa	9	3	3
French Morocco	8	9	9
Nigeria	6	6	6
Tunisa	5	8	6
Ethiopia	1	1	1
Mozambique	1	1	1
Total	54	46	42
Middle East and Eastern Mediterranean			
Bahrain	3	1	1
Greece	3	2	1
Iran	5	1	4
Iraq	14	13	12
Israel	12	4	4
Kuwait	3	3	5
Neutral Zone	2	2	3
Trucial Coast	4	1	1
Qatar	2	2	3
Saudi Arabia	4	4	4
Turkey	5	5	5
Total	57	38	43
Other Asia			
Australia	12	14	9
Burma	2	2	2
Indonesia and British Borneo	32	35	32
India	6	6	6
Pakistan	5	5	5
Japan	15	15	15
New Guinea	4	4	4
New Caledonia	1	1	1
Total	77	82	74
GRAND TOTAL	795	761	690

*Austrian rigs are in free-world total since Russia released control of industry last year.

Empresa Colombiana de Petroleos, on 2,200,000 acres of El Carare.

But Peru continues to hold exploration interest in South America, with emphasis shifting to the Eastern Montana region. At the beginning of the year, 30,098,841 acres had been granted or applied for in this area and extensive wildcatting is due to follow.

Gulf Oil Corp.'s deal with Bolivia last month for exploration rights on 3,750,000 acres of reserved lands also foreshadows more drilling for the country. Other firms also are interested in Bolivia.

Libya jumped into the spotlight with the grant of nearly 127,000,000 acres to a dozen companies since last October. Other countries which have opened new lands recently are Turkey, where 141 concessions have been cleared, and the Philippines, where drilling started this spring in the Cagayan Valley of Northern Luzon.

Venezeulan prospects . . . Potentially, Venezuela is the best prospect for a major increase in drilling activity.

Earlier this year, the government announced that it would consider bids and give companies a chance to modify bids submitted in 1954. This raised hopes that after 11 years new concessions would be granted. Heavy exploration programs would undoubtedly follow the grant of new acreage in order to build up new reserves to offset growing crude production.

In March, there were 100 rigs in use on exploration and production work, 57 in Eastern Venezuela, 40 in the west, and 3 in Barinas. Shell had the most active rigs with a total of 27. Mene Grande had 26, Creole 14, The Texas Co. 11, Socony Mobil 6, Sinclair and Varco 5, and Phillips and Richfield 3. Sinclair had two rigs and Socony Mobil one rig running in Barinas.

Guatemala also holds promise of extensive exploration activity. Thirty companies sought acreage last November under the terms of the new petroleum law. The grants are due to be approved as soon as problems of overlapping applications are settled.

American drilling contractors have a big role in foreign operations and will probably be in bigger demand as drilling expands. At present, U. S.-based firms are active in virtually every oil province in the free world. An important selling point contractors use is that operators can save money and avoid worries on contract drilling because of contractors' specialized experience *(The Oil and Gas Journal, September 26, 1955, page 122).*

Jersey to Explore Cuba Again

STANDARD OIL CO. (N. J.) has made its long-awaited move to resume active exploration in Cuba.

At the same time exploratory interest was heightened by the discovery of the island's first salt dome by Cuban Kewanee Oil Co. in northern Camaguey Province.

Esso Standard Oil Co. S. A., Jersey Standard subsidiary, has obtained exploration rights on 75 per cent of 926,525 acres which Cuban-Canadian Petroleum Co. holds under concession.

The deal gives Cuban-Canadian a 5 per cent overriding royalty on any crude production Esso develops on the acreage. Esso has the option of developing the remaining 25 per cent on a 50-50 basis with Cuban-Canadian, a subsidiary of American Leduc Petroleums, Ltd., Edmonton.

The concession areas are located in Havana, Matanzas, and Pinar del Rio provinces, where Jersey was active 11 years ago. The company drilled four wildcats in Pinar del Rio, one of them to 9,100 ft. Another was put down near the northern coast of Matanzas.

Jersey lost interest about 1951. The subsidiary, known as Essosa, is primarily a refining and marketing company, and has started a 35,000-bbl. daily refinery across the bay from Havana *(The Oil and Gas Journal, April 16, page 139).* But it has kept track of the growing exploration activity, particularly since the 1954 Jatibonico discovery in Camaguey.

The company set up a geological department 2½ years ago. Surface work has been carried out since then. J. H. Sawyer, formerly in charge of exploration for Creole in Eastern Venezuela, heads the program.

Salt dome discovery . . . Cuban Kewanee found the top of the salt dome at 6,200 ft. in a test being drilled on a farmout from Atlantic Refining Co. of Cuba.

Whether it will be productive remains to be seen. Some of the United States' most prolific production is from salt-dome fields along the Louisiana and Texas Gulf Coasts. No important fields have been found on interior salt domes in the U. S., however.

Still, any salt dome is considered a potential oil pool. And the discovery by Kewanee is perhaps the most encouraging development to the Cuban industry since Jatibonico. It would have been considered more significant had it been found on the southern part of the island where Tertiary sediments several thousand feet thick exist.

International BRIEFS

The Singapore Court of Appeal has reversed a decision of the War Damage Commission in a judgment favoring three oil companies seeking $1,670,000 compensation for oil used by British forces after the war. The companies are NV de Baataafsche Petroleum Mij. and NV Nederlandische Indische Aardolie Mij, of the Shell Group, and NV Standard Vacuum Petroleum Mij. *(The Oil and Gas Journal, September 19, 1955, page 103.)*

An American-backed carbon black plant will be built near Santos, Brazil. The government oil corporation, Petroleo Brasiliero, S.A. (Petrobras), will supply raw materials under a 10-year contract for the 30,000,000 lb. per year unit. Owners of the plant are Celanese Corp. of America, Columbian Carbon Co., Joseph S. Michaan, of New York, and Brazilian interests.

Two companies will build polyethylene plants in Brazil. A Union Carbide & Carbon Corp. plant will take feed stock from the government-owned Cubatao refinery. W. R. Grace & Co. and a German firm, Farbwerke-Hoechst A.G., Frankfort, which already have a jointly owned insecticides plant in Brazil, will build the other polyethylene unit.

Brown Drilling Co., Long Beach, a comparative newcomer in Venezuelan drilling, will move a second rig to Venezuela. The rig, a National 50, has been drilling in California. Brown entered Venezuela last fall.

A 3,530-bbl.-daily crude topping unit is being moved from Sucre to Santa Cruz in Bolivia. The Bolivian government company is transferring the unit for two reasons. Santa Cruz is a better location from which to serve products needs of eastern Bolivia. It also is located on a railroad which can be used to ship exports to Brazil.

An Argentine affiliate of Cia. Tecnica Internazionale (Techint), Milan, Italy, has a contract for a 90-mile section of the Campo Duran-San Lorenzo pipeline. Cost of laying the 12-in. line will be about $1,200,000. The line is a project of the government oil industry, Yacimientos Petroliferos Fiscales.

Rig Reaches Pakistan

Hunt International, Stanvac to be drilling soon in West Pakistan; promising structures located by photo surveys

TWO deep-drilling rigs will be in operation in Pakistan within the next 60 days in the beginning of an intensive exploratory program by two American companies.

The two separate operations are the culmination of agreements signed with Pakistan by Standard-Vacuum Oil Co. in 1954, and Hunt International Oil Co. last September. In each case the Pakistan Government owns 25 per cent of the operation with the American partner contributing 75 per cent of the capital.

In the past few weeks it has almost become a race to see which would get under way first. Here's how it stood last week:

. . . **Hunt International was unloading** $3 million worth of drilling equip- and supplies at Karachi.

The company organized by Nelson B. Hunt, Dallas independent and son of H. L. Hunt, noted Texas oil man, plans to set up its rig about 80 miles west of Karachi in the Dhak area along the coast of the Arabian Sea. Company officials said in Karachi last week they expect to start drilling within a month.

. . . **Stanvac's drilling equipment** was aboard three ships en route to Pakistan.

The Stanvac rig, complete with a prefabricated camp, will be set up near Jhudo in the Province of Sind. The location is in the Indus River Valley on one of two 5,000-sq.-mile concessions Stanvac has in West Pakistan. The company expects to start drilling by June 1. Stanvac also has 10,000 sq. miles in East Pakistan.

The Hunt operation . . . The 3,800 tons of equipment being unloaded by Hunt International last week includes the drilling rig with all its equipment, three airplanes, a 160-ton barge for water transportation in the Arabian Sea, trucks, trailer houses, refrigeration units, lighting equipment, and radio equipment for communications.

Officials of the Hunt concern were welcomed by Pakistan officials with a luncheon to celebrate the beginning of the operation. Abbas Khaleeli, secretary of the ministry of industries, commented that since his government is a partner in the venture it is only "too anxious" to do anything it can to make the operation a success.

T. L. Allen, geophysicist and head of Hunt's 40-man exploratory party, told the Pakistan's that photographic surveys of the 20,000-sq.-mile area where the company will operate look

STANVAC RIG is en route to West Pakistan where it is to be drilling within 60 days.

"fantastic." He said that the Makran coastal area of West Pakistan where the Hunt acreage is located looks better than any oil area he has seen in 28 years in the industry.

Allen referred specifically to three anticlines which preliminary surveys have already located. One is the Dhak structure which extends into the Arabian Sea from the coastal area. Another and larger anticline described by Allen for the local press is the Haro, which he said is 35 miles long and 8 miles wide. He said a third structure in the same general area has been located.

The geophysicist told his questioners he thinks only the remoteness of the area and its previously unsettled political climate have prevented oil exploration in the past.

What Stanvac shipped . . . The Stanvac operation involves moving a complete camp for Southeastern Asia Drilling Co. personnel in addition to the drilling rig.

The equipment includes eight four-man, air-conditioned bunk houses and three combination office-living quarter units, a mess hall, and cold-storage equipment. Diesel-powered generators will furnish electricity for the camp and also for drilling operations. The camp will have its own water-treating equipment and a complete machine shop for the repair of drilling equipment and company vehicles.

The drilling rig has a 140-ft. derrick, a 35-ton drawworks, three 500-hp. diesel engines, a 60-in. hydraulic brake, and two 8-by-20-in. mud pumps, each rated at 600 hp.

Every unit in the camp, including the rig, all its equipment, and the housing, is equipped with heavy steel skids for moving. A special ramp was built to the derrick floor to handle the 50-ton truck which will haul the drawworks to the location.

New Bolivian Deal

Two more tracts added to license of Bolivian Gulf

BOLIVIAN GULF OIL CO. has moved to get a bigger jump on other international companies in exploring acreage opened up by the new Bolivian oil code.

Bolivian Gulf has added two more blocks to the 3,750,000-acre tract on which it obtained rights from the government earlier this month *(The Oil and Gas Journal, April 2, page 91)*.

Besides the original block adjoining Camiri field in southern Bolivia, the company now has 1,482,000 acres in the central section and 2,717,000 acres in the east in Santa Cruz. Bolivian Gulf got in ahead of other companies interested in applying for formal concessions by offering to help finance a badly needed pipeline to the Pacific Coast of Chile as an export outlet for the country's surplus production.

The deal, and the new oil code under which it was made, are subject to approval by the Congress.

Gulf Oil Corp. owns 80 per cent of the venture. Three Tulsa firms own the rest. Falcon Seaboard Drilling Co. has 7 per cent, Barry & Reiner, independent producers, 7 per cent, and Williams Brothers, pipeline constructors, 6 per cent.

A letter of agreement has already been signed. Bolivian Gulf officials are going to South America soon to sign the formal contract.

The block adjoining Camiri field is considered the choice acreage of the country, and is located in the zone reserved for Yacimientos Petroliferos Fiscales Bolivianos, the government oil agency. Bolivian Gulf officials, who flew over the country, reported excellent structures also exist in the other areas.

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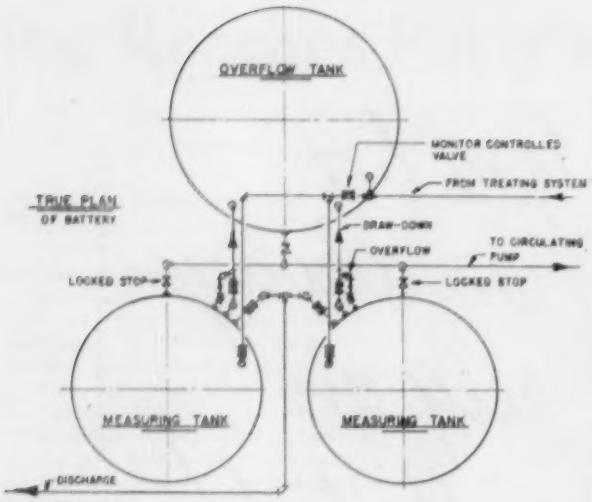


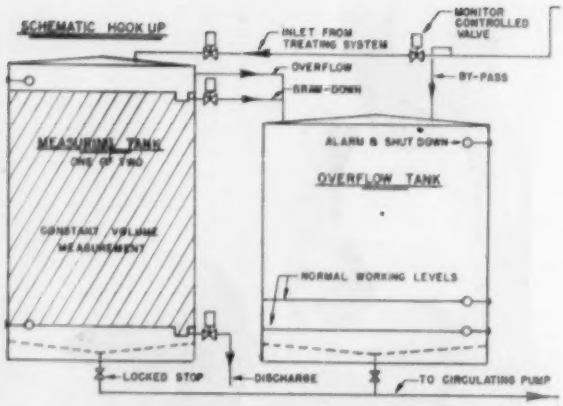


Fig. 1—Schematic of Gulf's battery in Kansas for automatic custody transfer.

Lease Automatic Custody Transfer Becomes a Reality

by S. H. Pope* and R. M. Stuntz†

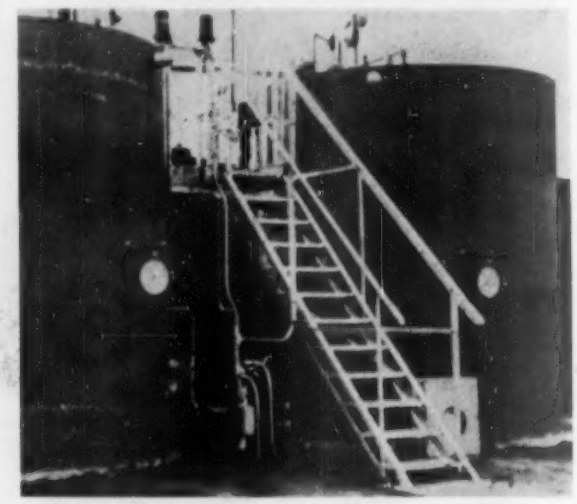


Fig. 2—Parallel measuring tanks of the battery. Note the two temperature recorders and one pressure recorder.

Here are design and operating details of the industry's first installation to sell oil from a lease automatically. The automatic battery is now in everyday operation deliveriing oil from a Gulf Oil Corp. lease to Kaw Pipe Line Co. Parallel measuring tanks, temperature recorders, dump counter, and a b.s. and w. monitor to reject bad oil make up the basic battery equipment. An electrical cam timer controls the operation.

AT 10:25 a.m. on Thursday, December 22, 1955, lease automatic custody transfer became a reality.

Exactly 216.76 gross barrels of Kansas Arbuckle crude were automatically delivered to the gathering pipeline company. This accomplishment, the first known instance of automatic sale at a lease level, was the result of cooperative effort by the Tulsa production division of Gulf Oil Corp. and Kaw Pipe Line Co., Tulsa.

Discussions and negotiations leading to this automatic sale began in early August 1955. This system of lease automatic custody transfer delivers constant-gross-volume dumps from two alternating measuring vessels. Tank No. 1 delivers 108.45 bbl. and Tank No. 2 delivers 108.31 bbl.

*Division mechanical engineer, Gulf Oil Corp., Tulsa production division. †Deceased; formerly division mechanical engineer, Gulf Oil Corp., Tulsa production division.

The Gulf-Kaw installation is not the first to contain the ability to automatically sell oil. Shell,[1,2] Sinclair,[3] Gulf, and presumably others have included the capability of automatic sale by various means in one or more tank batteries. Some of these systems were installed with the intent of automatic sales in the future after trial and pipeline agreements. Others were installed only as demonstrations.

The Gulf-Kaw installation was planned and installed to automatically sell crude oil at a lease level following adequate experience with a similar system installed as a demonstration. As soon as the system was completed and checked, lease automatic custody transfer was accomplished as intended.

After this initial run, the system was shut down for the holidays and to await availability of the January allowable. On January 9, 1956, continuous automatic sale of the monthly allowable was initiated. During recent months, the allowable on this lease has varied from

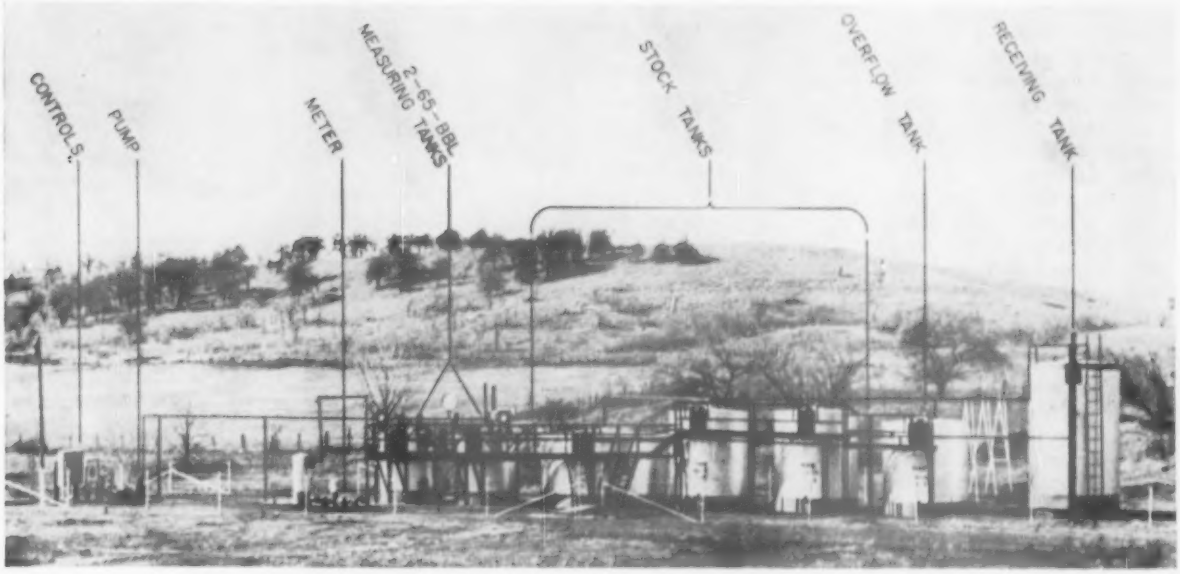


Fig. 3—Early tests and demonstrations were made at this battery near Tulsa.

5,000 to 6,000 bbl. per month. Successful application of lease automatic custody transfer will have important beneficial aspects for both producers and gathering agents.

Important features . . . This type of automatic-custody-transfer system was designed with these important features in mind:

1. The Gulf system follows essentially the sequence of operation now accepted by industry in manual measurement and delivery of crude oil from lease storage (as set forth in A.P.I. Standard 2500, "Measuring, Sampling and Testing Crude Oil").

2. This system delivers and records constant-gross-volume increments, measurements, deliveries, or dumps between fixed levels called "weirs." The use of fixed levels to obtain a constant-gross-volume measurement results in an inherent accuracy considerably above and beyond that obtainable by manual gaging. The resultant design has no possibility of inadvertent inaccuracy. For that reason, it might also be termed inherently honest!

3. Accuracy of measurement is not affected by float operation or speed of valve action.

4. A b.s. and w. monitor (a capacitance-sensitive instrument developed by Gulf Research & Development Co.) prevents the entry of nonmerchantable oil into the measuring tanks.

5. A preset counter permits sale of the monthly lease allowable plus or minus one gross-volume dump.

6. The oil progresses through the system primarily by gravity.

General description . . . In this system of automatic custody transfer, oil flows from the separator or treating system to one of two parallel alternating measuring tanks. These tanks deliver constant-gross-volume dumps between fixed levels (weirs). The number of gross-volume dumps is recorded, temperature of each dump is recorded, and a proportionate sample is taken for determination of A.P.I. gravity and b.s. and w.

Automatic sale of crude oil is recorded periodically on a standard-run ticket, with only minor modifications to accommodate the number of gross-volume dumps and gross barrels handled by each measuring tank during the gaging period.

This periodic-run ticket is substantiated by two temperature charts and one oil-height chart. This system is described in Fig. 1, showing the two measuring tanks, overflow tank, and piping. Fig. 2 shows the measuring tanks for the Kansas installation.

Background of Lease Automatic Custody Transfer

The profitable application of automatic controls to crude-oil-production operations has become increasingly frequent in recent years. Many of these installations center about automatic tank batteries with controls extending to each well. These automatic batteries are in rather common use in some areas, particularly in East Texas, some portions of West Texas, and other areas where conditions are conducive to this type of operation.

Interest in this subject has progressed to the point where many producers and pipeliners are contemplating the possibilities of completely automatic operations; that is, automatic control of production from the well, through producing equipment, measurement, and delivery. To investigate the feasibility of such a system, several test batteries have been installed. Some of the methods used have been reported in earlier papers and articles.[1,2,3,4,5]

Special A.P.I. Group

As a result of this interest, a special project group was formed in 1953 to prepare an A.P.I. Standard covering the automatic measurement and delivery of crude oil at a lease level. This group[6] reports to the A.P.I. Committee on Crude-Oil Measurements. It adopted the name "Lease Automatic Custody Transfer" to cover that portion of the Standard which they were to prepare.

Lease automatic custody transfer is defined as: (1) the automatic measurement and recording of quantity; (2) the automatic measurement of (or automatic sampling for subsequent determination of) quality and contaminant; and (3) the automatic running of crude oil from a lease into the connecting pipeline in accordance with predetermined schedules (if required) and on an unattended basis.

Lease automatic custody transfer provides a number of favorable economic aspects both to the producer and to the purchaser's agent, the pipeline company. Some advantages are:

1. An automatic-custody-transfer installation can be readily adapted to automatic lease operation, thereby providing the opportunity for considerable savings in costs of lease operation.

2. In many cases an automatic-custody-transfer installation will require less tankage than that normally used in the conventional tank battery.

3. From the pipeline company's standpoint, the automatic-custody-transfer system reduces the gager time required. Gagers can visit leases once a week or less frequently in order to accept custody transfer, rather than twice for each tank of oil run from a conventional battery.

4. General employment of automatic custody transfer should result in more efficient use of gathering systems. Currently, a major portion of pipeline runs are accomplished during daylight hours. With the automatic system, runs could occur during the entire 24-hour period.

Four methods of automatic custody transfer are under study. Three of the methods involve measurement of volume and one involves measurement of weight. Here they are in the following list:

1. Tandem metering and storage (surge tank and one measuring tank).[2]

2. Parallel metering tanks (two parallel alternating measuring tanks).

3. Positive displacement metering (A.P.I.-A.S.M.E. Code No. 1101—Petroleum P.D. Meter Code).[3]

4. Measurement by weight (equal increments of weight).[1]

Requirements of automatic battery . . . It was determined that the sequence of operation for a system of automatic custody transfer must meet certain requirements. These requirements, which provide the basis for the design of such systems, provide:

1. Assurance that the oil is merchantable.

2. A time for settling so that the oil, when gaged, is free of highly volatile fractions that would be lost in conventional handling and storage.

3. A control over time of entry of oil into the purchaser's or his agent's system if required.

4. A means of recording temperature at the time of top gage and, if required, at the time of bottom gage.

5. A means for recording each individual run.

6. Assurance that the purchaser or his agent receives the exact amount of gross oil indicated by each recorded run.

7. An accurate means of sampling for determination of b.s. and w. content and gravity of the oil delivered.

8. Fail-safe controls to prevent interference with the measuring cycle in event of power failure. Also, to make it impossible to introduce oil into a tank after the measuring cycle has started or to remove oil from the tank (other than into the purchaser's or his agent's system) after the top gage has been made and before the run is completed.

9. A method, manual or automatic as required, for recirculation of tank-bottom accumulations to prevent their reaching a height in excess of requirements of the purchaser or his agent.

10. A means of stopping delivery when the allowable—plus or minus a volume equal to a portion of one measuring tank delivery—has been run.

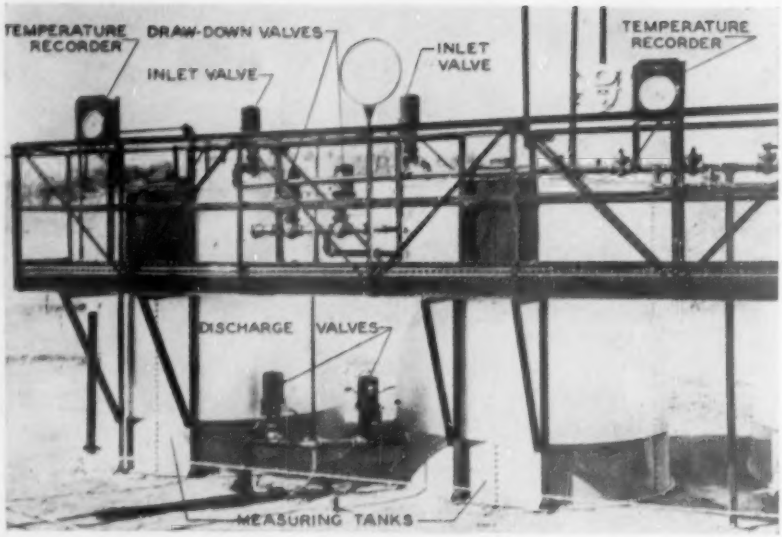


Fig. 4—Measuring tanks used in the demonstration design.

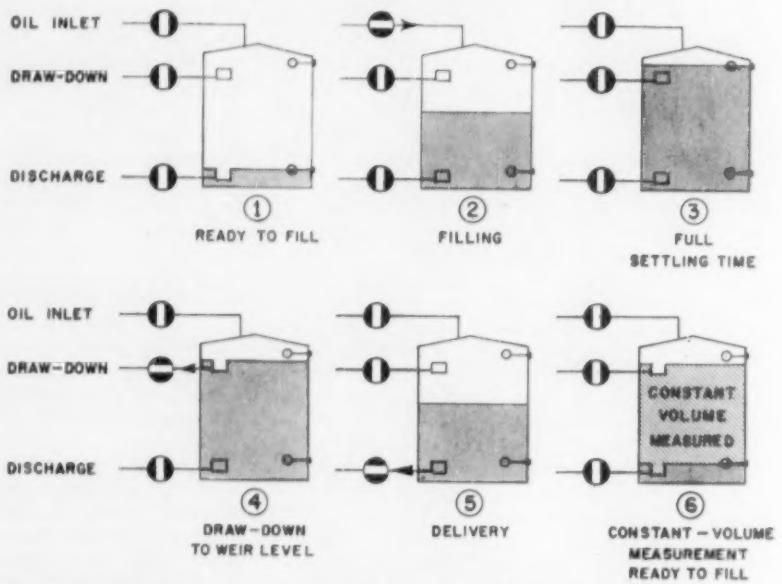


Fig. 5—Operating sequence of an automatic custody transfer system using a single tank.

At the recent A.P.I. meeting in San Francisco, it was agreed that the material secured to date is not ready for codification. So it was decided that an informational bulletin covering this subject should be prepared and, if approved, released. The following extract[7] is indicative of the attitude of the Committee on Crude Oil Measurements and its functional group on lease automatic custody transfer:

"A.P.I. Studies A.C.T. A.P.I. endorsement of automatic-crude-oil-measurement devices will be at least a year in coming, perhaps longer.

"The Committee on Crude Oil Measurements heard an interim report in San Francisco this week from the chairman of its working group on automatic-crude-oil-custody-transfer instrumentation, H. L. Shatto, Shell Oil Co.

"The report dealt primarily with information on, and plans for, an informational bulletin. The report will be circulated between now and

next spring among the 75 members of the committee for mail balloting. If the report is approved for committee sponsorship, another ballot of the group will be taken dealing with the actual standardization of instruments.

"These sources stressed the fact that the group is moving with deliberate slowness in order to give the industry abundant time to evaluate the certain advent of automatic crude custody transfer before it is faced with the economic necessity of applying the development."

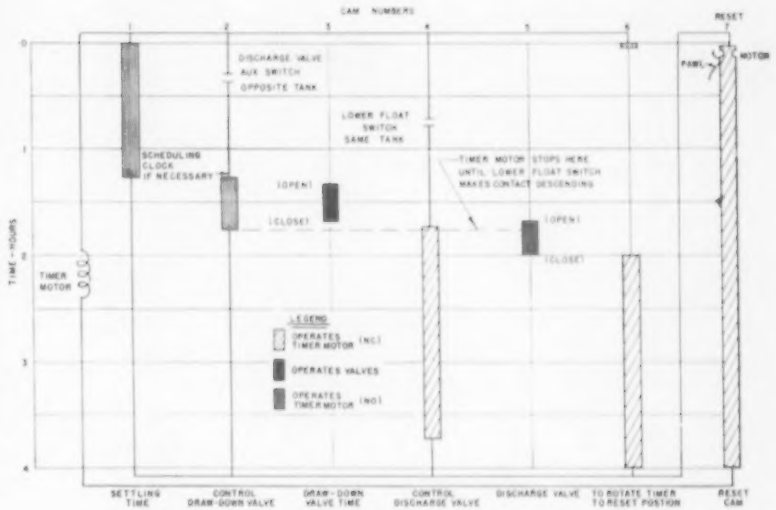


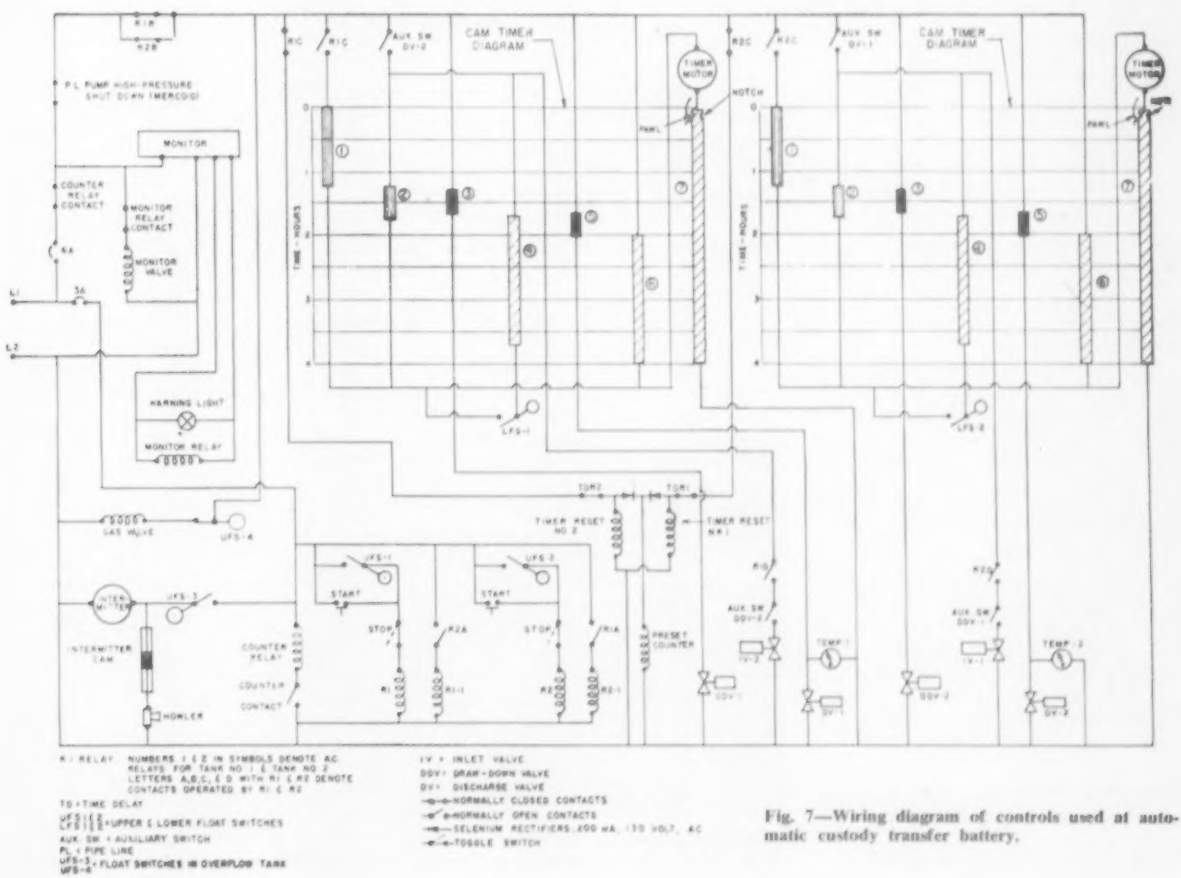
Fig. 6—Operation of cam timer used to control measuring cycle.

Early Gulf installation . . . For some years, Gulf management has been interested in the application of automatic equipment to production operations. Prior to becoming aware of A.P.I. activity in this effort, engineers in the Tulsa division were planning the experimental installation of an automatic tank battery with provision for automatic measurement and delivery.

After consideration of the various methods or systems which might be employed for this purpose, it was decided that the use of two parallel alternating measuring tanks represented the most desirable means.

Installation of an automatic-lease tank battery was approved, including an inherently accurate and practical method of automatically measuring gross volume and obtaining the associated data normally required in crude-oil delivery. This experimental demonstration was installed on a lease in Oklahoma. The demonstration operated successfully until it was dismantled for use in the Kansas installation.

The major components of the automatic system in Oklahoma included two calibrated alternating measuring vessels, 65-bbl. A.P.I. bolted-steel tanks, and one overflow tank—together with



K = RELAY. NUMBERS 1 & 2 IN SYMBOLS DENOTE AC RELAYS FOR TANK NO. 1 & TANK NO. 2. LETTERS A,B,C, & D WITH R1 & R2 DENOTE CONTACTS OPERATED BY R1 & R2

TD = TIME DELAY

UFS 1 & 2 = UPPER & LOWER FLOAT SWITCHES

AUX. SW. = AUXILIARY SWITCH

PL = PIPE LINE

UFS-3, 4, 5, 6 = FLOAT SWITCHES IN OVERFLOW TANK

IV = INLET VALVE

DDV = DRAW-DOWN VALVE

DV = DISCHARGE VALVE

—o—o— NORMALLY CLOSED CONTACTS

—o/ o— NORMALLY OPEN CONTACTS

—⊗— SELENIUM RECTIFIERS, 200 MA., 130 VOLT, AC

—o—o— TOGGLE SWITCH

Fig. 7—Wiring diagram of controls used at automatic custody transfer battery.

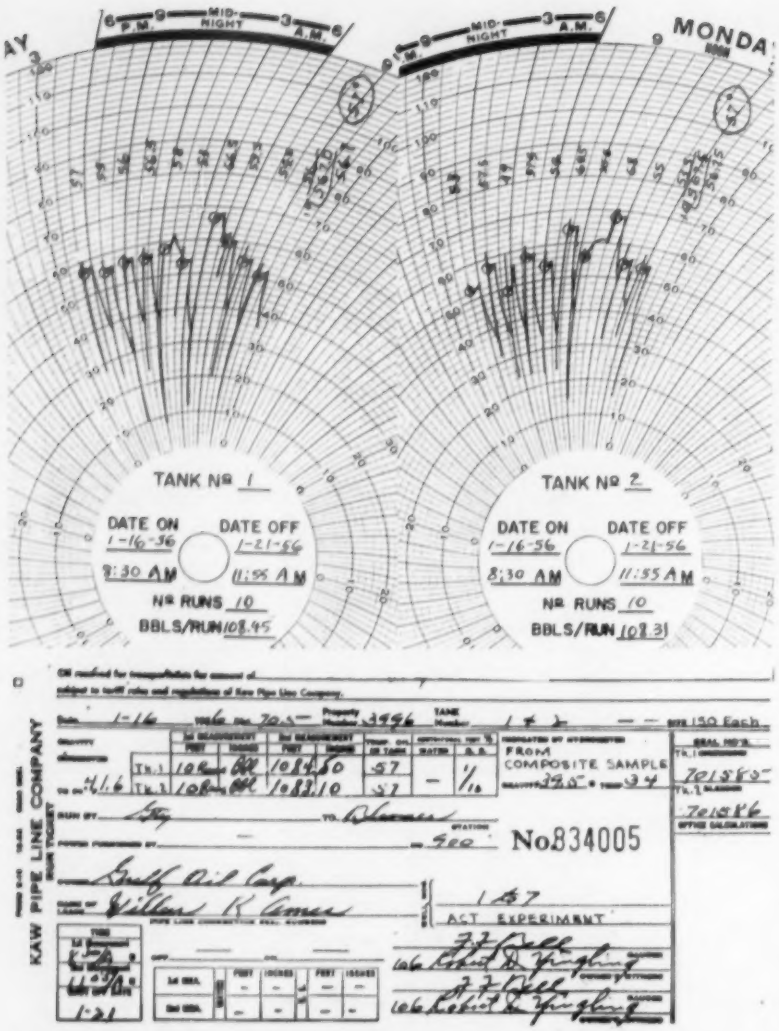


Fig. 8—Temperature records and run ticket from the Kansas installation. Note number of runs can be checked by pips on temperature chart.

the necessary electrical controls and sampling mechanisms.

This installation was made and operated as a demonstration. It delivered crude oil, after counting constant-gross-volume increments, into the regular stock tanks where it was gaged in the conventional manner. The design is flexible and may be adapted to any rate of production.

Fig. 3 is an over-all view of the battery, showing the automatic measuring tanks, controls, and pump which were installed for the demonstration — plus the regular stock tanks, overflow tank, receiving tank, and a meter which had previously been in use at this location. The two measuring tanks are shown in greater detail in Fig. 4.

Kansas installation . . . The design of the experimental demonstration proved to be basically sound. However, the accumulated experience from operation as a demonstration indicated a need for several modifications.

The sketch, Fig. 1, shows the arrangement of two measuring tanks and one overflow tank which was used for the Kansas installation. Principal changes and additions indicated in this sketch are as follows:

1. Drawdown into an overflow tank of less height than the measuring tanks instead of into the other measuring tank.
2. Addition of a separate overflow connection on each measuring tank.
3. Addition of a capacitance-sensitive type of "bad oil" monitor and monitor-controlled valve.
4. Addition of an automatic pump-out for the overflow tank.
5. Addition of a lease shutdown float in the overflow tank.

Detailed sequence of operation . . . The sequence of operation in one of the measuring tanks is illustrated in Fig. 5. In the first view, the tank is ready to fill and the three electrically operated globe valves are closed. When the other measuring tank fills to the float switch above the top weir level, the stream of merchantable oil is diverted from the full tank to one which is ready to be filled.

Interlocking of the electrical circuits controlling the inlet valves with the actions of the valves and float switches makes it impossible to open the inlet valve on a tank which is full, drawing down, pumping out, or at any time the discharge valve is open. In the second view, filling is in progress.

When this tank has filled to the upper float-switch level (as indicated in the third view), the incoming stream is switched back to the second tank and the full tank begins its measuring cycle. This cycle consists of: time for settling; time allowed to drawdown or bleed down to the fixed top weir level; and time for pump out or gravity delivery.

Measuring cycle . . . Control of the measuring cycle is furnished by a multiple cam timer. In Fig. 6, can be seen the function of each cam and the time in which that cam is effectively controlling the operation.

This type of control allows for a maximum of flexibility. Each cam is adjustable as to its position relative both to the others and to the amount of time it is effective. Further flexibility is available through interlocks in the system which allow the clock to be stopped during its time cycle.

At the end of the settling time, the drawdown valve opens as shown in the fourth view of Fig. 5. All oil above the top weir level flows over the weir and into the overflow tank, thus establishing an exact known oil height. Some concern was expressed at first regarding the time required for drawdown. It was found that drawdown to weir level was accomplished in about 10 minutes.

At the end of the drawdown time, the drawdown valve closes and the discharge valve opens. In accordance with current gaging practice, the temperature of the oil is automatically recorded at this time. In the fifth view (Fig. 5) a delivery is in progress. The delivery may be accomplished by either gravity or pumping. In this installation, a pump is started when oil from the constant-volume delivery raises floats in a chamber connected to the suction line.

The timer clock stops during the delivery to allow for a nondeterminable delay as might occur in a gravity delivery. The clock is again started through the action of a float set immediately above the lower weir. At a predetermined interval after the lower

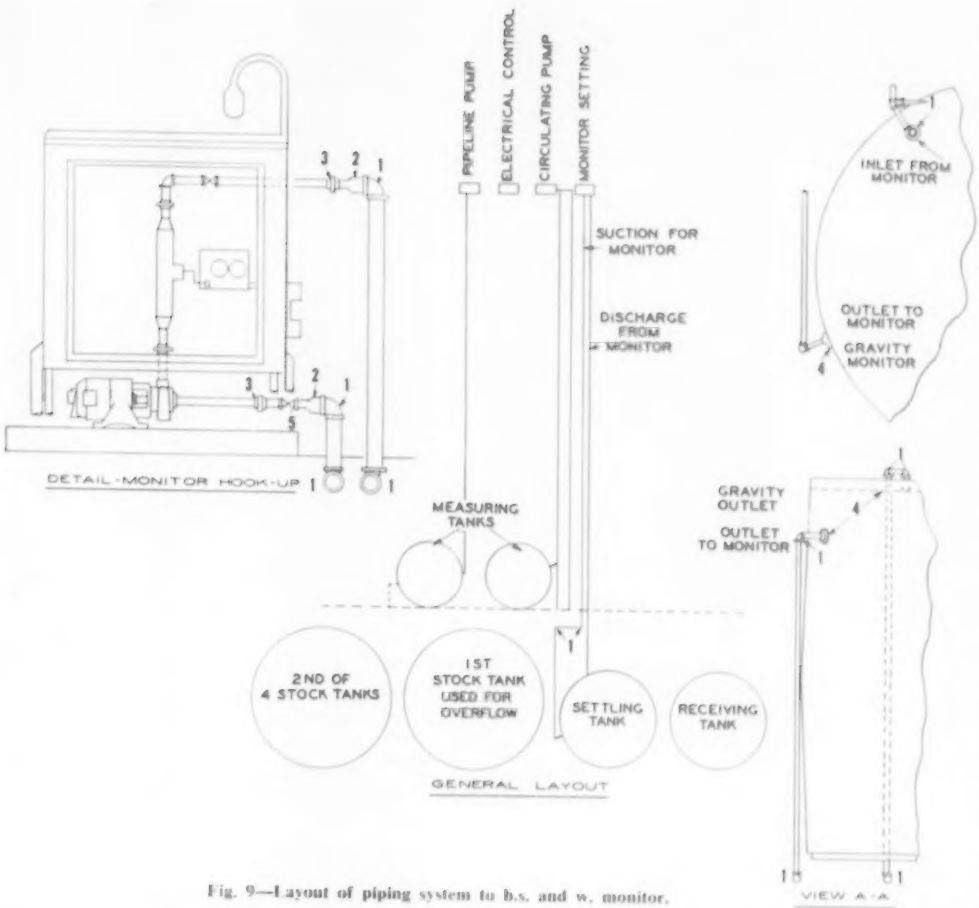


Fig. 9—Layout of piping system to b.s. and w. monitor.

float switch makes contact, the discharge valve closes. The tank is again ready to fill. The sixth view (Fig. 5) illustrates this condition, thus completing the measuring cycle. This view also illustrates the constant-gross-volume-measurement feature.

Control circuits . . . A graphic description of the electrical control circuit for the automatic-custody-transfer system is shown in Fig. 7. The control system utilizes latch-type, mechanically held relays to insure proper continuity of operation following current interruptions. Float switches, valves, cam timers, and other instruments are shown pictorially where practicable.

Operation of the pipeline pump is controlled by two float switches in the float chamber (which is in the suction line to the pump). When the discharge valve on a measuring tank opens, allowing the constant volume delivery to flow to the pump, the floats are raised and the pump motor is started. The proportional sampler is driven by a vane in the oil-discharge line during deliveries. The sample is stored in a spherical pressure container.

Record of deliveries . . . There are several ways in which a record of the volume measured is obtained and verified. Fig. 8 shows a temperature record which also may be interpreted as a record of the number of constant-gross-volume measurements. The characteristic shape of the temperature record is produced by activating the chart only when the discharge valve is open. Thus a record of the number of constant-gross-volume increments delivered is made, as well as a record of the temperature at the time delivery is started. On the example, the run temperatures have been circled.

The run ticket for custody transfer covering a gaging period is prepared as shown in Fig. 8. Record of measurement is also obtained by an electrical preset counter, and by a pressure record for each tank recording the height of oil throughout the cycle. The latter method provides an independent verification of the volume measured.

In addition to recording gross volume and temperature, it is also necessary to provide means for determination of A.P.I. gravity and b.s. and w. At this battery, a vane-driven proportional sampler provides a sample from a point near the discharge of the rotary pipeline pump during deliveries. The sample is collected in a pressurized container and is centrifuged periodically in the usual manner for determination of b.s. and w. This same sample is also used for A.P.I. gravity determination.

Fig. 10—Probe and control panel of b.s. and w. monitor.

B.s. and w. monitor . . . One of the primary requirements of a system of lease automatic custody transfer is the assurance that oil is of merchantable quality. Contamination limits for merchantable oil vary from area to area. A common requirement in the Mid-Continent area is "not more than 1 per cent b.s. and w. or 0.3 per cent free water." An automatic system must be able to sense and turn down oil having b.s. and w. or water in excess of the prescribed limits.

In the Gulf-Kaw automatic-custody-transfer installation in Kansas, this assurance is provided by a capacitance-sensitive instrument.[8] The b.s. and w. monitor, as the instrument is called, continuously samples oil from the treating system prior to its entry into the measuring tanks.

In case the dielectric constant of the

passing sample stream indicates bs. and w. in excess of limits, oil going to the measuring tanks is diverted to the overflow tank until the treating system is able to correct the situation. When the oil from the treating system again becomes merchantable, it is again admitted to the measuring tanks. Piping arrangement and general layout of the monitor are shown in Fig. 9. The monitor cabinet and controls are shown in Fig. 10.

The limiting action of this monitor is adjustable from 0 to 3 per cent b.s. and w. Initiation of the closure of its controlled valve follows a time delay which may be adjusted for 5 to 60 minutes. Provision may be made for addition of emulsion breaking chemical when bad oil is detected.

Throughput Capacity

The throughput capacity of an automatic-custody-transfer system of parallel metering tanks is dependent upon timing of the measuring cycle, rate of production, rate of delivery, and size of tankage. The complete cycle in each measuring tank consists of the following elements (with the noted timing variation):

Cycle elements—	Variation in time (hours)	Approx. timing Kansas installation (hours)
Filling	at 10 bbl. per hour—11 at 20 bbl. per hour— 5½	7-11
Settling	Adjustable	1½
Drawdown	Adjustable	½
Delivery (pump out or gravity flow)	at 55 bbl. per hour—2 at 200 bbl. per hour—½	2 ½
Wait to fill	Depends on other elements of cycle	4-6

Time equation for normal cycle:

$$F_1 = S_2 + d_2 + D_2 + W_2$$

and

$$F_2 = S_1 + d_1 + D_1 + W_1$$

Cycle at maximum capacity:

$$F_1 = (V_1+f)/R_f = S_2+D_2+(V_2/R_d)$$

$$\text{Max. } R_f = (V_1+f)/[S_2+D_2+(V_2/R_d)]$$

Approximate maximum rate of fill for Kansas installation:

$$\text{(At } R_d = 55 \text{ bbl. per hour)}$$
$$= (110)/[1\tfrac{1}{2}+\tfrac{1}{2}+(110/55)]$$
$$= 110/4$$
$$= 27.5 \text{ bbl. per hour}$$

$$\text{(At } R_d = 200 \text{ bbl. per hour)}$$
$$= (110)/[1\tfrac{1}{2}+\tfrac{1}{2}+(110/200)]$$
$$= 110/2.55$$
$$= 43 \text{ bbl. per hour}$$

where:

F = filling time, hours
S = settling time, hours
d = drawdown time, hours
D = delivery time, hours
V = constant - gross - volume dump barrels (approx. 107-110 bbl.)
R_f = rate of fill, bbl. per hour
R_d = rate of delivery, bbl. per hour
W = waiting time, hours
f = overfill, barrels (about 2-3 bbl.)
$_1$ = measuring tank No. 1
$_2$ = measuring tank No. 2

As noted in these calculations, the maximum capacity of the Kansas lease-automatic - custody - transfer system is 660 bbl. per day (27.5 × 24) when the pumpout rate is 55 bbl. per hour. If a higher rate of delivery can be achieved, say 200 bbl. per hour, the maximum capacity of the system is about 1,000 bbl. per day.

The system is quite flexible, being applicable both to a wide range of tank sizes and shapes and to a range from small rates to thousands of barrels per day.

Application of Lease Automatic Custody Transfer

Representatives of numerous production, pipeline, and manufacturing companies have inspected and discussed the experimental installation. Other producers are considering the use of automatic - custody - transfer tank batteries featuring constant-volume deliveries between fixed levels (weirs), particularly in larger or unitized properties.

Comparisons of costs of automatic tank batteries (with provisions for automatic sale of oil vs. conventional tank batteries) were made using several different-sized properties. From these comparisons, it was found that:

1. For leases with producing rates in excess of 500 bbl. of oil per day, costs of installation of the automatic batteries are generally somewhat less than conventional batteries.

2. For leases with producing rates of less than 500 bbl. of oil per day, the costs of conventional batteries are substantially less than automatic batteries.

3. The automatic battery is readily adapted to completely automatic-lease operation. In one case, the savings resulting from completely automatic-lease operation would have paid out the added cost of automatic installation in less than 2 years.

4. While relatively flexible in operation and readily applied to any tanks, the design for the automatic-custody-transfer installation, when once fixed, has a definite maximum capacity. An automatic-custody-transfer installation, like any other production-handling design, should be sized with respect to the maximum anticipated production rate.

Advantages of Weir Control and Constant Volume Measurement

Levels established by weirs are inherently accurate and honest. After weir heights are once established, weirs can be locked in position and the volume between weirs remains unchanged. Weir position can be easily checked at any time.

Constant and equal volumes per measuring cycle offer several advantages. A composite sample made up of individual samples from each measuring cycle can be collected in a single pressurized container and used for determinations of contaminant and gravity of the oil over the period collected. Also, the temperatures recorded at the time of the top gages can be averaged and used to determine the volume correction of the gross oil run during a period.

Acknowledgment

The authors wish to express their appreciation to the many persons who have directly or indirectly assisted in the demonstration project and the Kansas installation. Particularly to Kaw Pipe Line Co. for their wholehearted cooperation and constructive criticism and suggestions; to Electrical Specialties Co., Tulsa, for assistance in supplying controls to accomplish the designated functions; and to Gulf Oil Corp. for permission to publish this information.

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PNEUMATIC HOIST moves valves into and out of chemical cleaning solutions. Fig. 1.

How Ethyl Keeps Rein On Upkeep Costs—2

by Larry Resen
District Editor

A SIGNIFICANT aspect of Ethyl Corp.'s maintenance program at its Houston plant is its use of on-the-job methods to expedite repairs.

One example is the plant's valve-repair shop, where improvements have made it possible to handle all valve repairs within the plant.

The valve-repair shop is located in the central shops building. It holds the following major equipment:

1. Two nickel-lined steam-jacketed cleaning vats.
2. One 10-in. swing lathe with 22-in. centers.
3. One lapping block.
4. One bench grinder, shop-made, with a lapping disk on each end of the shaft.
5. One bench drill with lapping attachments.
6. One relief-valve-testing table with four outlets for testing different size valves.
7. One jib crane (rotating 360°) to facilitate handling large valves.

Cleaning vats . . . One of the major improvements at the shop was the installation of chemical cleaning vats, Fig. 1. The two steam-jacketed vats are connected in parallel and are heated with 40-psi steam.

The first vat contains a solution of Oakite and the second contains a solution of Wedac. The temperature of the Oakite solution is maintained at 200° F., and the solution is used for removing oxides and paint. The Wedac solution is used for degreasing the valves, but it also acts as a rust inhibitor.

A pneumatic hoist is used to lift the valves in and out of the vats. It is controlled by a simple three-way valve, and it operates on 80-psi. plant air.

The vats eliminate the time-consuming and tiresome job of scraping and wire-brushing the valve bodies. Now, with a minimum of effort, it takes a maximum of 40 minutes to thoroughly clean the valves and coat them with a rust-inhibitor pending overhaul and painting.

Lapping bench . . . To facilitate lapping large surfaces, a bench grinder was constructed with a lapping disk mounted on each end—one coarse, one fine (Fig. 2).

A hinged metal guard covers both the shaft and the circumferential areas of the blocks. In Fig. 2, this guard is lifted to expose the mechanism—but this was only for photographic purposes. Normally, the guard is secured in place.

The lapping blocks are so mounted that a solid lapping surface area is exposed. With this method, the tedious job of handlapping is expedited by these high-speed blocks.

Lapping seals . . . An ingenious method has been devised for lapping mechanical seals. A lapping disk is secured in a pneumatic drill, and the drill is supported in a bench vise so that the lapping surface is horizontal (Fig. 3). A guide ring about the same diameter as the lapping disk is then supported to just clear the surface of the lapping disk.

This guide ring has an extension arm welded to its side, and this fits into a special jig clamped to the drill body. The extension arm slides through a housing on the jig. This housing is equipped with a bolt for locking the guide ring in any desired position. The guide ring, set up to just clear the surface of the lapping disk, is also adjusted to be slightly off center with the disk's axis.

As many as four different-sized seals may be handled at once with this arrangement. Lapping compound is applied to the disk, and then the seals are placed within the guide ring within each other. The drill is then started and the lapping disk rotates.

Because of the off-center aspects of the guides, the seal rings travel in eccentric fashion about the disk. This provides the necessary action between the disk and the seals. The eccentric travel, meanwhile, prevents the seals from sticking to the compound and merely traveling around with the disk as it rotates.

With this arrangement, the lapping disk can be set up, the seals placed on it, and the drill turned on to begin the operation. Once this is started, it runs unattended until the proper amount of lapping has taken place. Since this works so effectively, the practice now is to accumulate many seals and then do a great number at once.

Milling cutter . . . To expedite repair of valve seats, a milling cutter is used to cut pits out of valve seats (Fig. 4). The valve body—with bonnet and stem removed—is placed in a rack made from an H-beam, and then is locked in place by a chain. This chain is secured on one side of the beam and

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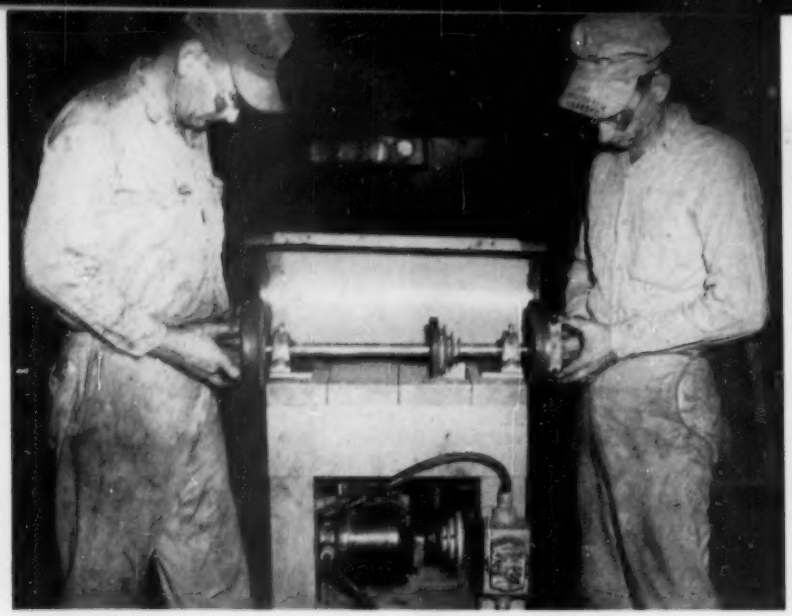


LAPPING DISKS mounted on both ends of this shaft. Guard has been lifted to expose chafting for illustrative purposes. Fig. 2.

PNEUMATIC DRILL rotates lapping disk which handles several mechanical seals at one time. Fig. 3.

welded to a shortened valve stem. This valve stem fits through a bracket welded to the side of the beam. The chain is made up tight by rotating the valve handle located between the bracket which takes up on the valve stem.

With the valve body thus securely in place, the milling cutter assembly is then placed in position. This assembly is made up on an old valve stem and bonnet. The cutter is secured to the base of the assembly and then the bonnet is slipped into place over the holddown bolts on the valve body. With the cutter thus making contact with the valve seat, a pneumatic drill is used to rotate the stem to achieve the deesired cutting effect.

Drill press . . . Two separate arrangements are used for lapping valve seats using a drill press for rotating the lapping disk. In the one instance, using a large drill press, the lapping disk is mounted on the end of the shaft assembly including a universal joint (Fig. 5). This simplifies the procedure because a perfect lineup is not necessary between the center of the drill press and the valve body.

The valve body itself is bolted in place on a holddown rack on the drill press. The shaft, extending into the valve body, is held rigid by a flange attaching to the valve body. Once the assembly has been set up, the drill is started and lapping takes place. Meanwhile, the operator adjusts the lapping block during the operation to assure that the entire surface is being worked at once.

On the smaller drill press, a spring-loaded assembly is used for the lapping block (Fig. 6). The shaft extending upward from the lapping block is equipped with a heavy spring to avoid too much pressure being applied to the lapping block. The portion of the shaft which fits into the chuck on the drill press, meanwhile, has been machined so that it is off center slightly from the main shaft.

Acknowledgments

The cooperation of the management of Ethyl Corp. in the release of this material and the assistance of Glenn Hayes, plant manager, and J. C. Klock and J. F. Kobler, Jr., are gratefully acknowledged. The efforts of F. M. Bradford in compiling the necessary information are especially appreciated.

MILLING CUTTER which machines valve seats is made up of valve stem and bonnet. Fig. 4.

LARGE DRILL PRESS has lapping disk arrangement using a universal joint to obtain eccentric rotation. Fig. 5.

DRILL PRESS is used to drive milling disk through eccentric shaft connection as shown here. Fig. 6.

100 OCTANE GASOLINE . . .

by Once-Through Platforming

by Davis Read and P. C. Weinert

DATA from commercial units on sustained operation over extended periods of time show that 100-octane leaded reformate can be produced by Platforming. The stocks used in the tests include both Middle East stocks, which are low in naphthenes, and the more naphthenic Mid-Continent naphthas.

These results have been achieved under once-through operating conditions employing the R-5 catalyst which has been in use for several years and without regeneration. Two new catalysts, designated as R-7 and R-8, have been developed specifically for high-octane-gasoline production, and results are even better than those obtained with the R-5 catalyst.

Many commercial units are now making a product of 97 to 98 leaded research octane in an economical once-through operation with runs lasting 10 to 11 months without regeneration of the catalyst. This period of 10 to 11 months corresponds roughly with a catalyst life of 90 bbl. of naphtha processed per pound of catalyst in the reactors or a catalyst cost of only slightly over 4 cents per barrel of naphtha charged.

Authors are with Universal Oil Products Co., Des Plaines, Ill. Paper presented at annual meeting, Western Petroleum Refiners Association, San Antonio, March 19-21.

Due to the fact that we are now being requested to design new Platforming units for the production of fuels testing 100 leaded octane and higher, we have investigated a number of different methods of approaching the problem to arrive at the most economical solution.

One important approach to the problem of producing higher octane gasoline economically is, of course, the development of a better catalyst specifically designed to do this job. This paper will, therefore, also present data on two new Platforming catalysts, known as R-7 and R-8, for comparison with the R-5 catalyst.

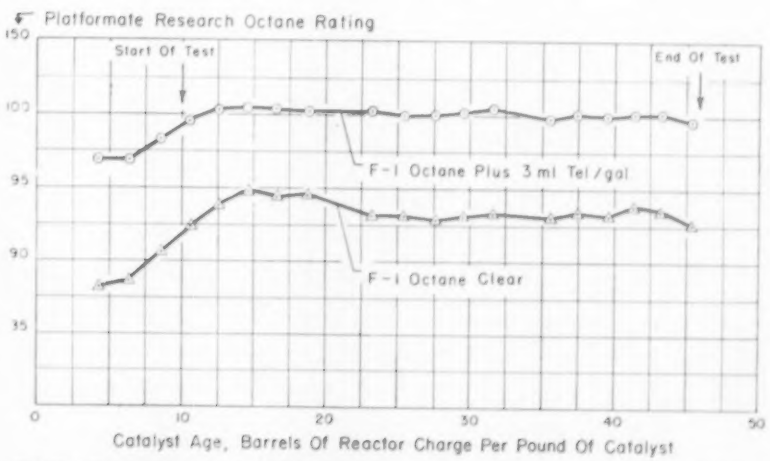
Processing Mid-Continent Naphtha

The data given in Table 1 show the results of a commercial run processing a Mid-Continent naphtha over R-5 catalyst in an 11,000-bbl. per stream day unit. These results are an average of those obtained during the period of the test run corresponding with a catalyst age from 22 to 32 bbl. per pound. This period was selected as a more accurate representation of the performance and stability of the Platforming catalyst than data obtained with fresh catalyst and for short periods of time.

The naphtha charge in this case consisted of two streams, one of which was the product from a Unifining unit processing the high-boiling portion of a Mid-Continent thermally cracked naphtha, and the other was a light straight-run Mid-Continent naphtha from an oxygen stripper. These streams were blended in about equal volumes and charged to the unit.

The 200°-384° F. charge stock contained 0.012 per cent sulfur, 52 per cent naphthenes, and 8 per cent aromatics. This is just slightly higher in naphthene content than the average Mid-Continent naphtha. It should be emphasized that this feed stock is not a selected narrow boiling cut, but is a heavy naphtha representative of that charged to the unit during the entire run.

A yield of 83.5 volume per cent of 100.3 leaded research octane number was obtained from the bottom of the stabilizer. The clear octane rating was 93.0 at 4.8 lb. R.v.p. This product, when blended with sufficient butane to make gasoline-volatility specifications, will test about 93.5 clear and 100.4 with the addition of tetraethyl lead.



OCTANE NUMBER OF REFORMATE as a function of catalyst age in processing Mid-Continent naphtha. Fig. 1.

TABLE I—YIELD AND PROPERTIES OF MID-CONTINENT CHARGE AND PRODUCT

(11,000-bbl. per stream day commercial unit using R-5 catalyst)

	Naphtha charge	Recovered reformate
Yield, volume per cent	100	83.5
Gravity, °A.P.I.	55.0	49.0
Hydrocarbon analysis, volume per cent:		
Paraffins	40	
Olefins	Trace	
Naphthenes	52	
Arocatics	8	
A.S.T.M. distillation, °F.:		
I.b.p.	200	110
10 per cent	222	154
20 per cent	235	180
50 per cent	265	245
90 per cent	332	336
End point	384	419
Sulfur, weight per cent	0.012	nil
Reip vapor pressure, lb.		4.8
Research octane ratings:		
Clear	48	93.0
Plus 3 ml. TEL/gal.		100.3

Reformate splitting . . . It should also be noted that the octane ratings given are for the total reformate and not the heavy naphtha cut. If this reformate is fractionated into a light cut of about 320° F. end point and a 320°-420° F. heavy naphtha, the heavy naphtha will represent about 30 per cent of the total and have a research clear octane rating of above 102.

Even though this was the first run after construction of this unit was completed, the operation was well lined out and stable as indicated by the data given in Fig. 1. This plot shows the relationship between the clear and leaded octane number of the reformate produced versus the catalyst age in barrels of reactor charge per pound of catalyst in the reactors.

Note that at the beginning of the high-octane test, the catalyst had an age of 10 bbl. per lb. and at the termination of the test period the age was 45 bbl. per pound. It thus represented an increment of 35 bbl. per pound during the high-octane test. This corresponds with about 4 months of operating time.

The catalyst still was not spent at the end of the 100-octane test. The average reactor-inlet temperature was increased only about 15° over this 4-month period in order to maintain the octane level. The hydrogen content of the recycle gas, which is another indication of the stability of the operation, varied less than 10 per cent during this period.

Processing Kuwait Naphtha

A 6,000-bbl. per stream day Platforming unit is now processing Kuwait naphtha and making about 100-octane leaded reformate. This unit contains a prefractionator (the column near the center of the accompanying photo) used to prepare a naphtha feed to the reactor of the desired boiling range. An amine scrubber is used to remove hydrogen sulfide from the recycle gas.

The yield and properties of the Kuwait naphtha charge and reformate are given in Table 2. The Kuwait naphtha is, of course, a very low-naphthene-content material. This makes it one of the most difficult feed stocks to process for the production of high-octane reformate.

In this commercial run, which is still continuing, the 213°-348° F. naphtha feed contains 22 per cent naphthenes, 11 per cent aromatics, and 0.04 per cent sulfur. Table 2 shows that a yield of recovered reformate of 76.5 volume per cent is being obtained and that it has a 92.5 clear research octane rating which increases to 100 octane on the addition of 3 ml. of TEL per gallon.

This product contains about 2 per cent butanes and has a Reid vapor pressure of 6.4 lb. Again it should be emphasized that these data were obtained on the total reformate produced and not just the heavy higher-octane cut from the product.

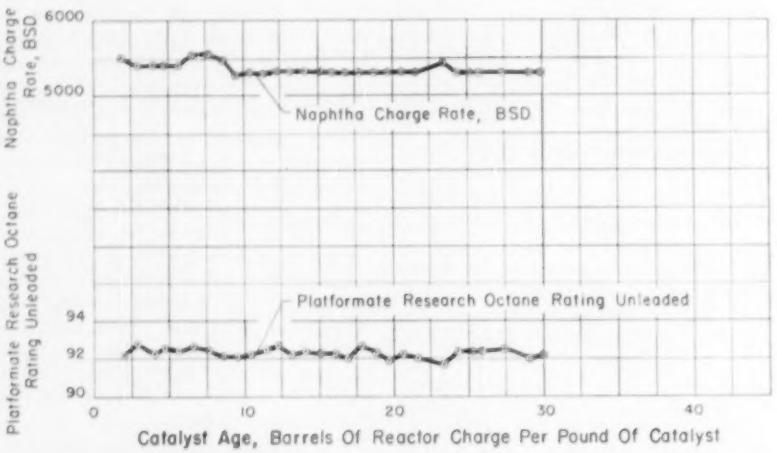
Catalyst life . . . The catalyst life experience obtained up to the present time on this unit is given on Figs. 2 and 3. Fig. 2 shows: (1) the charge rate in barrels per stream day; and (2) the clear octane number of the reformate versus the catalyst age in barrels of feed per pound of catalyst in the reactors. These data show that the operation is extremely stable—as further evidenced by the fact that the reactor-inlet temperatures have increased only about 7° since the start of the run.

Inasmuch as the refiner who operates this unit does not normally run octane numbers of the reformate at the 3 ml. of TEL level, only the clear octane number of the product is shown on this plot. This 92-93 clear octane

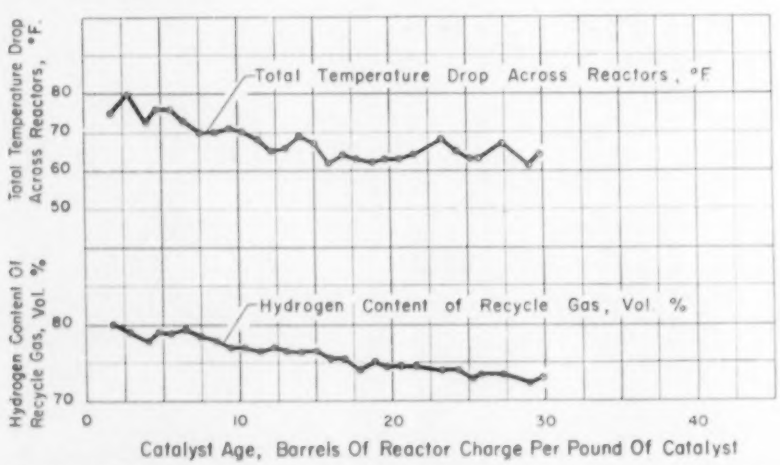
TABLE 2—YIELD AND PROPERTIES OF KUWAIT CHARGE AND PRODUCT

(6,000-bbl. per stream day commercial unit using R-5 catalyst)

	Naphtha charge	Recovered reformate
Yield, volume per cent	100	76.5
Gravity, °A.P.I.	58.1	53.1
Hydrocarbon analysis, volume per cent:		
Paraffins	67	
Olefins	Trace	
Naphthenes	22	
Aromatics	11	45.7
A.S.T.M. distillation, °F.:		
I.b.p.	213	97
10 per cent	234	139
30 per cent	251	186
50 per cent	269	218
70 per cent	288	279
90 per cent	332	322
End point	348	379
Sulfur, weight per cent	0.04	nil
Reid vapor pressure, lb.		6.4
Research octane ratings:		
Clear		92.5
Plus 3 ml. TEL/gal.		100



REFORMATE OCTANE RATING and charge rate as functions of catalyst age when processing Kuwait naphtha. Fig. 2.



TEMPERATURE DROP across reactors and hydrogen content of recycle gas as functions of catalyst age when processing Kuwait naphtha. Fig. 3.

reformate will rate about 100 with 3 ml. of TEL per gallon.

Although it is not shown on Fig. 2, there was a short shutdown period at a catalyst age of roughly 22 bbl. per pound. This was necessary to repair a leaking stabilizer overhead condenser. The catalyst was left in the reactors during this period, and the unit was started up again to continue the run producing the same octane number reformate. Catalyst age at the present time is 30 bbl. per pound, corresponding with some 5 months' operation.

Reactor temperatures . . . Additional evidence of the stability of the Platforming operation and the ruggedness of the catalyst is given by the data plotted on Fig. 3. The total temperature drop across the three reactors (or total ΔT) and the hydrogen content of the recycle gas are plotted versus catalyst age for the entire period. The total temperature drop is of course less for the Kuwait feed stock than it would be for a better feed stock containing more naphthenes.

This is due to the fact that one of the most heat-consuming reactions in Platforming is the dehydrogenation of naphthenes to aromatics. Thus a feed stock containing very little naphthenes will require less reheating between reactors and will be processed with less reactor-temperature drop than a higher naphthene feed such as Gulf Coast or Mid-Continent naphtha.

The important observation to be made from the data given on Fig. 3, however, is the fact that the total reactor-temperature drop shows such a very low rate of decline over the entire length of the run when producing 100-leaded-octane gasoline. The total ΔT decreased less than 15° F. during this period. In addition, the hydrogen content of the recycle gas also shows a very slow change with increased catalyst age.

This amounts to a reduction in hydrogen purity of less than 10 per cent, as was the case with the commercial test run on the Mid-Continent naphtha. Obviously, then, considerably fewer complications are involved in conducting this type of operation as compared with one in which a cyclic type of fixed-bed regeneration is required—with wide variations in gasoline and gas yields and reactor conditions over short periods.

On the basis of the observed rates of changes in the plant performance, it is predicted that this unit can continue to operate in the same successful manner for some time.

An important factor which contributes to the achievement of this type of commercial operation is the tremendous amount of information and experience available from a large number of Platforming units operating on widely different feed stocks. This information and experience serves as a basis for continuously assisting the refiner, when necessary, in maintaining good operations.

TABLE 3—YIELD AND PROPERTIES OF GULF COAST CHARGE AND PRODUCT
(5,000-bbl. per stream day commercial unit using R-5 catalyst)

	Naphtha charge	Recovered reformate
Yield, volume per cent	100	90.6
Gravity, °A.P.I.		48.1
Hydrocarbon analysis, volume per cent:		
Paraffins	41	
Olefins	Trace	
Naphthenes	43	
Aromatics	16	
A.S.T.M. distillation, °F.:		
I.b.p.	198	98
10 per cent		132
30 per cent		238
50 per cent	274	273
70 per cent		304
90 per cent	325	351
End point	376	413
Reid vapor pressugre, lb.		8.4
Research octane rating:		
Clear	52	94.0
Plus 2 ml. of TEL/gal.		99.5
Plus 3 ml. of TEL/gal.	77	100.3

TABLE 4—COMPARISON OF R-5 AND R-7 PLATFORMING CATALYSTS IN COMMERCIAL OPERATION PROCESSING PENNSYLVANIA 400° F. END POINT STRAIGHTRUN GASOLINE
(1,500-bbl. per stream day commercial unit)

Test number	1	2	3
Catalyst	R-5	R-7	R-7
Catalyst age, barrel per pound catalyst	4	3	19
Properties of charge stocks:			
Composition, volume per cent:			
Propane	1.1	1.1	1.5
Butanes	4.5	4.9	5.2
Pentanes plus	94.4	94.0	93.3
Hydrocarbon analysis, volume per cent:			
Paraffins	68	65	66
Olefins	2	3	3
Naphthenes	23	24	24
Aromatics	7	8	7
Observed reformate yields:			
(100 per cent weight recovery), volume per cent	78.6	82.9	81.4
Properties of reformate:			
Research octane clear	88.8	89.3	88.7
Plus 3 ml. TEL per gal.	98.3	98.3	98.4
Reid vapor pressure, lb.	9.4	11.5	11.3
Adjusted reformate yields,* volume per cent	81.1	82.9	83.0

*To same vapor pressure, octane number and charge composition as Test 2.

Processing Gulf Coast Naphtha

To produce 100-octane-leaded total reformate, the reactor inlet temperatures have been increased and the reactor charge rate has been decreased enough to reach the required severity of operation.

The data given in Table 3 show the results of one such run on a 5,000-bbl. commercial unit processing Gulf Coast naphtha over R-5 catalyst. This 198°-376° F. straightrun naphtha, containing 43 per cent naphthenes and 16 per cent aromatics, was processed to produce 90.6 per cent of 94-clear-research-octane-number reformate which increased to 99.5 octane with the addition of 2 ml. of TEL per gallon and 100.3 octane with 3 ml. of TEL per gallon.

This product had an 8.4-lb. R.v.p. The naphtha feed is not pretreated in this unit, but it contains very little sulfur and other contaminants. This naphtha is also lower in naphthene content

TABLE 5—YIELDS AND PROPERTIES OF KUWAIT CHARGE AND PRODUCT
(2-bbl. per stream day pilot plant using R-8 catalyst)

	Naphtha charge	Recovered reformate
Yield, volume per cent debutanized	100	77.0
Gravity, °A.P.I.	58.1	50.5
Hydrocarbon analysis, volume per cent:		
Paraffins	67	
Olefins	Trace	
Naphthenes	22	
Aromatics	11	
A.S.T.M. distillation, °F.:		
I.b.p.	213	117
10 per cent	234	159
30 per cent	251	199
50 per cent	269	247
70 per cent	288	296
90 per cent	332	359
End point	348	394
Sulfur, weight per cent	0.04	
Research octane ratings:		
Clear		93.5

than what might be considered an average Gulf Coast stock. Some Gulf Coast naphthas contain as high as 65 to 70 per cent naphthenes and hence would give considerably higher yields at a given octane number.

At the end of a 1-week test at a catalyst age of about 22 bbl. per pound (while producing high-octane reformate), the operating conditions were changed back to the normal conditions and the run was continued. It was eventually shut down at a catalyst life of 118 bbl. per pound of catalyst. The refinery was primarily interested in learning what capacity limitation existed in his unit when producing 100-plus-octane leaded gasoline. During this test, there was no indication of a loss in catalyst activity.

Improved Platforming Catalysts

All of the commercial data which have been discussed thus far have been obtained while using the R-5 type of Platforming catalyst. Considerable work has been done in developing new catalysts for specific use in high-octane operations. Table 4 shows a comparison of the R-5 and R-7 catalysts in commercial operation when processing a Pennsylvania 400° F. end point, full-boiling-range, straightrun gasoline.

This unit normally charges roughly 1,500 bbl. per stream day of full-boiling gasoline containing 5 to 7 per cent of propane and butane. During the test on the R-5 catalyst and the two tests on the R-7 catalyst, there was some variation in the composition of the feed stock as noted in the table. But when the yields are adjusted to the same vapor pressure, octane number, and charge composition as Test 2, the data show an advantage of about 1.8 volume per cent in yield for the R-7 catalyst over the R-5 catalyst under the conditions of the test.

In addition, the yield obtained in Test 3 on the R-7 catalyst at a catalyst age of 19 bbl. per pound checks with the yields obtained on this catalyst at an age of 3 bbl. per pound. This indicates no loss in catalyst selectivity over this period.

Another catalyst designated as R-8 has been developed, but it has not yet been tested in a commercial unit. Data are available, however, on a 2-bbl. per day pilot plant at a catalyst age of roughly 20 bbl. per pound. These data are given in Table 5.

In this case, the same Kuwait naphtha (as used in the 5,000-bbl. per stream day commercial run on R-5 catalyst) was charged to the pilot plant. A yield of 77.0 per cent of 9.5-clear-research-octane debutanized reformate was obtained in this operation.

A comparison of these data with the data given in Table 2 on the R-5 catalyst indicate that the R-8 catalyst produced about 2 per cent more yield than R-5 on the Kuwait charge stock. This was after the data from the commercial run were corrected for the butane content of the Platformate.

Summary and Conclusions

It is feasible to produce commercially 100-leaded-octane-number gasoline from two different charge stocks at a catalyst life of at least 30 to 35 bbl. per pound when using the R-5 type of Platforming catalyst. This commercial experience of 4 to 5 months of sustained operation confirms our belief that there is considerable doubt about the economic justification for installing and operating regeneration facilities on a Platforming unit.

Our research efforts have been directed primarily toward improving the Platforming catalyst for higher octane and better yields, and thus avoiding these additional regeneration costs. There are many indications that even-longer catalyst life can be obtained without regeneration when using the R-5 type of catalyst. The new R-7 and R-8 catalysts show a yield advantage in both commercial and pilot-plant operations over the R-5 catalyst. And it is expected that these new catalysts will give even longer life than the R-5. If, for example, gasoline testing 100 leaded octane or above can be made with a good yield at a catalyst life of 90 bbl. per pound (as has been done many times commercially at the 97-98 leaded octane level), the catalyst cost will be only slightly over 4 cents per barrel of naphtha processed.

STYRENE SHOVEL BREAKS GROUND at the site of Cosden Petroleum Corp.'s new styrene plant at Big Spring, Tex. Shown at the ground-breaking ceremonies, are E. B. McCormick, chief engineer for Cosden; Badger Project Engineer Hector Butler; D. C. Myers, Badger job superintendent; Cosden Refinery Superintendent George Grimes; P. A. Seaver, project coordinator for Badger; Cosden President R. L. Tollett; and Dan Krausse, Cosden manager of manufacturing.

Cosden Building a Styrene Plant

CONSTRUCTION on a $3,000,000 styrene plant, the first in West Texas, has begun at Cosden Petroleum Corp.'s refinery in Big Spring, Tex. Scheduled completion date for the petrochemical plant is set for November 30.

Badger Manufacturing Co. of Cambridge, Mass., was awarded construction contract in December 1955.

The plant, upon completion, will produce some 20 million pounds of the styrene each year, for use in the manufacture of plastics and synthetic rubber. Raw material for the plant will be obtained from the xylene output of Cosden's BTX plant at the same site. The project is part of an $11,500,000 expansion program of Cosden.

Both the Cosden and Badger companies participated in ground-breaking ceremonies for the plant. A styrene shovel was used in turning the first dirt.

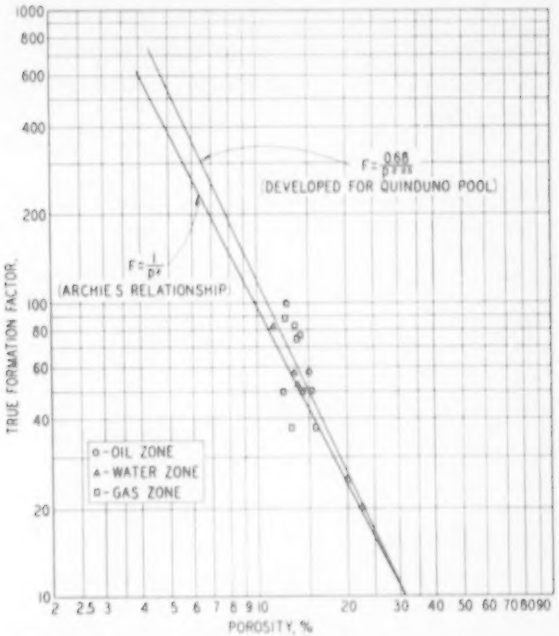
Planned for the plant are modern, improved techniques of separation including ultrafractionation for the recovery of ethyl benzene direct from petroleum stock such as from mixed xylene streams. The ultrafractionation process will utilize 200-ft. towers to effect the separation.

Other projects of the expansion, either under construction or on the drawing board, include addition of a Rexformer, a feed-preparation unit, revamping of the present cat cracker, a 102-mile, 6-in. pipe line to Abilene, and a 9-mile products line to nearby Webb Air Force Base.

WELL-LOGGING STUDY

Special Logging Package Saves $1,000 per Well

by Joe D. Owen



POROSITY determined by core analysis correlates with formation factor at Quinduno (Wolfcamp formation). This relationship lets log analysis replace core-porosity measurement. Fig. 1.

In Quinduno field of the Texas Panhandle the best and most economical logging combination for quantitative formation analysis in saline muds is the gamma ray, Microlaterolog, and Laterolog. Other surveys are unnecessary. Results show that coring of the formation can be eliminated with log analysis replacing core analysis.

THE study here described has shown that by applying the basic principles of electric-log interpretation, values of porosity and water saturation may be obtained that are as accurate as core analysis in Quinduno field. By use of data obtained from the gamma ray, Microlaterolog, and Laterolog, the coring, much drill-stem testing, and logging of the brown dolomite with the electrical survey, neutron, and MicroLog tools have been eliminated from the completion program. Economic studies of subsequent wells in this area have shown that a saving of approximately $1,000 per well can be effected in this way.

Quinduno field is located in Roberts County, Texas, and produces from the lower Albany dolomite of Wolfcamp age at approximately 4,000 ft. The structure is a northwest-southeast trending anticline which dips approximately 100 ft. per mile. The reservoir, as now defined, comprises an area of over 13,000 acres and contains a gas column of approximately 100 ft. in thickness and an oil column varying from 12 to 30 ft. in thickness. Below the oil column is a water zone.

The top 70 ft. of the formation is gas bearing. Below this, the dolomite is vugular with cavities and contains interoolitic porosity ranging as high as 33 per cent. Permeabilities in the lower dolomite range as high as 19,500 md. Development shows that it is highly recrystallized with extensive vertical fracturing. Cores show streaks of anhydrite and occasionally the presence of conglomerate. The average porosity is about 17 per cent in the producing section below the gas-oil contact.

Purpose of study . . . All of the wells included in this study were rotary drilled to the approximate top of the pay section, cored through the pay, drill-stem tested, logged, and cased with 5½ or 7-in. casing through the pay section. The casing was perforated at the intervals determined from core analysis and drill-stem-test data. The mud used was salt-saturated with a resistivity of approximately 0.04 ohm-m. at the bottom-hole temperature of 100° F. The wells were logged with the following surveys: standard electrical survey, MicroLog, Microlaterolog, Laterolog, and gamma ray neutron.

This combination logging, testing, and coring program was considered by the operating department to be excessively expensive. This study was started in an attempt to arrive at a less-costly completion program that would be as good as, if not better than, the old one. The wells included in this study were chosen because of their nearness to undeveloped acreage, and the information will be of value in future development.

Theory and method of analysis . . . To decrease completion costs, the elimination of coring and core analysis is a likely starting point. If porosity and water saturation can be obtained from the logs, then coring may be eliminated.

The wells selected for determining porosity and water saturation from resistivity logs are the 1-A Stone, 3-A Pennington, 1-B Pennington, 1-A Mathers, 1 Agatha, and 1 Gay. The 4-A Edge and 1-B Edge wells are used for some calculations in the water zone.

Calculation of Porosity

A fundamental relationship in the quantitative evaluation of porosity is that of the formation factor. Formation factor may be defined as the ratio

Author is with Phillips Petroleum Co., Bartlesville, Okla. Paper presented at A.I.M.E. Formation Evaluation Symposium, Houston, 1955.

PRODUCING

"Average porosity of the producing oil interval as calculated by use of the Microlaterolog is 15 per cent, as compared to an average of 17 per cent from core analysis."

of the resistivity of a sample or rock when 100 per cent saturated with a given resistivity to the resistivity of that water. Or:

$$F = R_o/R_w \qquad (1)$$

where:

R_o = resistivity of the rock sample when 100 per cent saturated with water resistivity, R_w

R_w = resistivity of the water

From Equation 1, it may be seen that if the resistivity of the rock and the resistivity of the water saturating this rock are known, the F may be determined. With this fact in mind, consider the invaded zone surrounding the bore hole. This invaded zone occurs as a result of the mud filtrate being forced into the formation with the fluids that may have been present in the formation being moved back away from the bore-hole wall.

Flushed zone resistivity . . . This flushing process actually replaces the connate fluid with a filtrate from the mud of resistivity, R_{mf}. If the flushing action has been complete, and the rock interstices are 100 per cent saturated with the mud filtrate, then the formation factor of the rock surrounding the bore hole wall can be found by measuring the resistivity of this flushed zone and the mud resistivity.

The most common case of incomplete flushing of the rock matrix occurs when the rock is originally hydrocarbon bearing. Seldom is the rock matrix flushed completely if it is oil-bearing. This residual oil may run as high as 40 per cent, but generally runs in the range of 15 to 30 per cent. Since residual oil will disturb the validity of Equation 1 by increasing the resistivity of the zone, a correction must be made.

Residual oil correction . . . When the flushed zone contains not only mud filtrate, but an amount of residual oil, the resistivity of the flushed zone will not be R_o. Rather, it will be a value referred to as R_{xo}, the resistivity of the flushed zone—regardless of the degree of flushing. R_{xo}, then, is a resistivity that includes the true R_o, plus an additional amount of resistivity due to the residual oil. Since this residual oil causes R_{xo} to be higher than the true R_o of the formation, it is necessary to reduce this value of R_{xo} by some correction. This correction[1] is applied by multiplying value of R_{xo} by $(1 - ROS)^2$, where ROS is the residual saturation present in the flushed zone express as a decimal fraction. Then, taking into account this correction, Equation 1 may be written as:

$$F_a = R_{xo}/R_{mf} \qquad (2)$$

where:

F_a = apparent formation factor

R_{xo} = resistivity of the formation when less than 100 per cent saturated with mud filtrate

R_{mf} = resistivity of the mud filtrate

or, taking into account the correction factor:

$$F_t = (1 - ROS)^2 R_{xo}/R_{mf} \qquad (3)$$

where:

F_t = true formation factor

ROS = residual-oil saturation as a decimal fraction

As an example, if the ROS is taken as 20 per cent, then the ratio F_t/F_a would be:

$$F_t/F_a = (1 - ROS)^2 = (1 - 0.2)^2$$

$$= 0.64$$

Porosity relationship . . . There is a definite relationship between the formation factor of a rock and its porosity. This relationship was first investigated by Archie[2] and may be expressed in general as:

$$F_t = K P^{-m} \qquad (5)$$

where:

F_t = true formation factor

K = some constant yet to be determined (generally 1)

P = porosity fraction

m = cementation factor

If sufficient data are available from core analysis, it is possible to establish a value for m. This cementation factor varies from approximately 1.3 for unconsolidated sands to higher than 2.2 for consolidated sandstones and limestones.

Winsauer, et al.,[3] developed a variation on the original work by Archie which removes the cementation factor

TABLE I—CALCULATION OF POROSITY AND SATURATION

Well—	Depth	R_{mf}	R_o	R_{mf}	F_t	R_{xo}	R_t	Calc. S_w (%)	Core por. (%)	Archie (%)	Winsauer et al. (%)	Comments
1-A Stone	4,130-4,132	3.50	1.75	0.03	58.3	7.0	15.0	34.0	15.0	13.3	12.5	Oil zone
1-A Mathers	4,026-4,031	4.50	2.25	0.03	75.0	21.0	64.0	18.8	13.6	11.6	11.0	Gas zone
	4,042-4,050	6.00	3.00	0.03	100.0	20.0	60.0	22.4	12.2	10.0	9.4	Gas zone
	4,088-4,104	3.00	1.50	0.03	50.0	9.0	24.0	25.0	15.1	14.0	13.0	Oil zone
1-B Mathers	4,030-4,038	3.00	1.50	0.04	37.5	8.5	17.5	29.4	12.0	16.5	15.0	Gas zone
	4,064-4,073	7.00	3.50	0.04	87.5	15.0	40.0	29.6	12.3	10.9	10.2	Gas zone
	4,098-4,104	3.00	1.50	0.04	37.5	8.0	28.8	28.8	15.2	16.5	15.0	Gas zone
	4,106-4,118	2.00	1.00	0.04	25.0	4.0	7.0	38.0	20.3	20.0	18.0	Oil zone
3-A Pennington	4,174-4,184	†1.00	*1.00	0.05	20.0	†1.2	1.2	91.5	23.3	22.5	20.0	Water zone
1 Agatha	4,016-4,020	18.00	9.00	0.04	225.0	32.0	100.0	30.0	12.9	6.8	6.8	Gas zone
	4,026-4,034	11.00	5.50	0.04	138.0	34.0	100.0	23.5	12.1	8.8	8.4	Gas zone
	4,036-4,046	6.00	3.00	0.04	75.0	33.0	100.0	17.4	13.3	11.8	11.0	Gas zone
	4,056-4,066	4.00	2.00	0.04	50.0	9.0	20.0	31.4	12.2	14.0	13.0	Gas zone
	4,075-4,084	9.50	4.75	0.04	119.0	85.0	300.0	9.2	10.5	9.3	8.9	
	4,086-4,096	5.00	2.50	0.04	62.5	900.0	900.0	5.3	15.0	12.8	12.0	Oil-water zone
	4,120-4,130	2.00	1.00	0.04	25.0	3.0	5.0	45.0	19.2	20.0	18.0	Transitional zone
	4,134-4,146	2.50	*2.50	0.04	62.5	*3.0	3.0	91.5	13.7	12.8	12.0	Water zone
1 Gay	3,933-3,943	7.00	3.50	0.08	43.7	23.5	55.0	25.2	21.3	15.0	13.9	Gas zone
	3,952-3,965	7.50	3.75	0.08	47.0	28.0	70.0	23.2	19.7	14.6	13.5	Gas zone
	3,995-4,006	6.00	3.00	0.08	37.5	22.5	50.0	24.5	20.4	16.5	15.0	Gas zone
	4,018-4,026	2.60	1.30	0.08	16.3	7.0	13.0	31.0	26.2	25.0	22.0	Gas zone
	4,120-4,125	9.60	*9.60	0.08	120.0	*7.5	7.5	100.0	9.8	9.1	8.8	Water zone
4-A Edge	4,110-4,122	†2.30	*2.30	0.04	46.0	†5.0	5.0	68.0	13.3	13.3	12.5	Water zone
1-B Edge	4,105-4,120	†5.00	*5.00	0.06	83.0	†7.0	7.0	84.4	11.4	11.0	10.5	Water zone

*When the saturation calculates to be 50 per cent or more, the ROS correction is dropped ($R_{xo} = R_o$) and no departure curve correction is necessary ($R_{xo} = R_t$). †Values taken from E.S.—16 in. normal and 19 ft. lateral.

TABLE 2—POROSITY, WATER SATURATION AND DRILL-STEM-TEST DATA

Well—	Depth	R_{mf}	R_w	R_{mf}	F_t	R_{xo}	R_t	Calc. S_w (%)	Core por. (%)	Quinduno correl. (%)	Drill-stem-test data
1-A Stone	4,127-4,139	4.0	2.0	0.03	66.8	7.0	13.0	39.2	14.3	13.5	Perf. 4,127-39 ft.; initial production 40 bbl. oil per day, 3 bbl. water, 183 M.c.f., GOR 4,575.
1-A Mathers	4,108-4,112	6.0	3.0	0.03	100.0	17.0	48.0	25.0	14.9	11.0	Perf. 4,180-20 ft., initial production 314 bbl. oil per day, no water, 208 M.c.f., GOR 656.
1-B Mathers	4,122-4,128	3.0	1.5	0.04	37.5	6.0	10.0	38.8	17.4	17.0	Perf. 4,121-26 ft., initial production 184 bbl. oil per day, no water, 64 M.c.f., GOR 348.
1 Agatha	4,120-4,132	2.0	1.0	0.04	25.0	3.0	5.0	45.0	19.2	20.0	Perf. 4,120-32 ft.; initial production 20 gal. salt water per hour, 143 M.c.f., squeeze cemented with 50 sacks.
1 Gay	4,084-4,092	11.0	5.5	0.08	67.8	18.0	36.0	39.0	10.5	13.5	Perf. 4,081-91 ft., initial production 2,630 M.c.f., 2 bbl. mud, 1 bbl. water, squeeze cemented.

from condensation. This relationship is:

$$F_t = 0.62\ P^{-2.15} \qquad (6)$$

with F_t and P as defined in Equation 5.

It should be understood that Relationships 5 and 6 are general and will not apply specifically to any one locality without adjustment. The most common practice is to plot the actual porisities from core analysis versus the formation factors for a given producing horizon and develop in that way a curve for a specific locality. This was done for the Quinduno field and resulted in a relationship.

$$F_t = 0.68\ P^{-2.23} \qquad (7)$$

The F_t values were determined by use of Equation 3 and the porosity taken from core analysis. The results of this plot are shown on Fig. 1.

Using logs . . . To actually use the logs to find the porosity of the producing intervals, there are several things that must be known. Since to find the porosity it is first necessary to determine the formation factor, the terms that must be known or found from the logs are: R_w, R_m, R_{mf}, ROS, and R_{xo}. R_m can be found on the logs as a recorded value and R_{mf} may be determined either by analysis of the mud or by reference to a table of average values such as those published by the service companies.[4] The R_{mf} values used in this study were taken from standard tables of R_m, R_{mf}, and R_{mo}.

No produced water information was available for these wells. This being the case, the spontaneous potential log provides an indication as to the connate-water resistivity.[5] The S.P. curve is completely flat and without character throughout the field. Therefore, the water resistivity may be assumed to be equal to the mud-filtrate resistivity. This is true because the relationship between R_w, R_{mf} and the S.P. is expressed as:

$$S.P. = K \log R_w / R_{mf} \qquad (8)$$

With the S.P. value at zero, the ratio R_w/R_{mf} must be equal to unity; thus, the conclusion that the connate-water resistivity is equal to the mud filtrate resistivity or approximately 0.04 ohm-.m.

The Microlaterolog was chosen as the device to indicate the resistivity of the flushed zone. The current penetration into the formation is only a few inches, and is thus negligibly affected by the unflushed formation.[1] The resolution of the Microlaterolog is very high and as a result departure curves are unnecessary.

Field case . . . To illustrate the method of calculation for determining the porosity over an interval, a section from the 1-A Mathers well (Fig. 4) interval from 4,098 to 4,104 ft., Zone C, is analyzed:

R_m = 0.04 ohm-m., R_{mf} = 0.03 ohm-m. (from standard tables), R_{xo} = 3.0 ohm-m. (resistivity as read by the Microlaterolog).

Using Equation 3, and assuming a residual-oil saturation of 30 per cent:

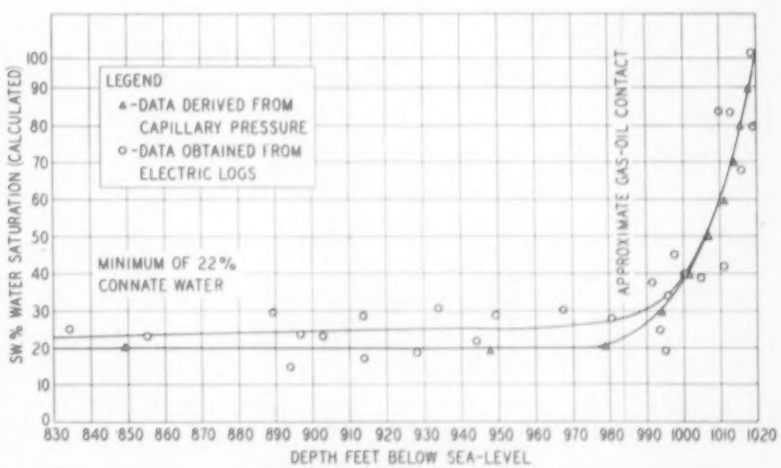
$$F_t = (1 - ROS)^2\ R_{xo}/R_{mf}$$

$$= (1 - 0.3)^2\ 3.0/0.03 = 49$$

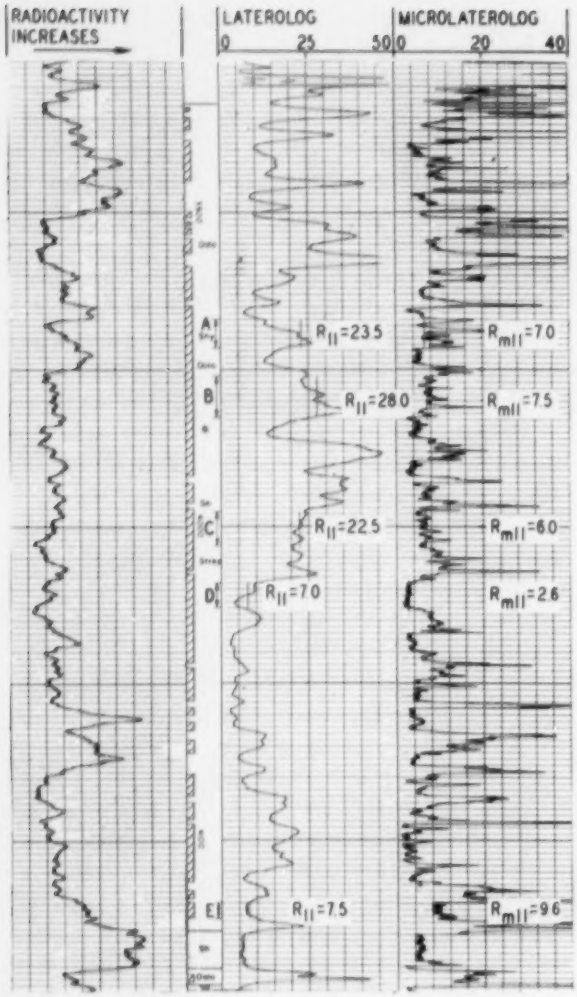
Going to the F_t vs. P curve (Fig. 1) which was developed for use in Quinduno field, this F_t corresponds to a porosity of 15 per cent. The porosity of this interval as determined from core analysis was 15.2 per cent.

Table 1 shows the porosity values calculated for a large number of intervals from several wells along with the porosities determined from core analysis. Inspection shows the correlation between the two values to be very good.

The result obtained in this study of porosity determination in Quinduno field indicate that the Microlaterolog provides good quantitative results when the values measured by it are cor-



WATER SATURATION calculated with electric-log data agrees very well with capillary-pressure curve. Gas-oil contact is quite distinct and oil-water contact is transitional. Fig. 2.



GAY NO. 1

SAMPLE CALCULATION. ZONE D-4018-4026

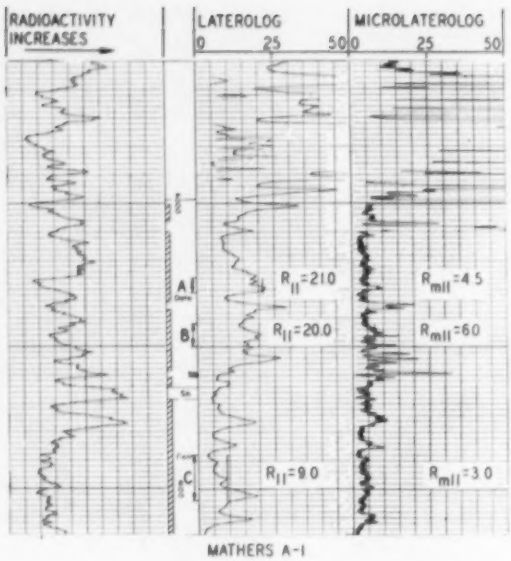
R_{mLL} = 2.6 Ω-m ROS (assumed) = 30 % $(1-ROS)^2$ = .5
R_m = 0.1 Ω-m R_{mf} (from table) = 0.08 Ω-m
R_{LL} = 7.0 Ω-m R_T (using Departure Curve for D_i = 10) = 13 Ω-m

$$F_1 = \frac{R_{xo}(1-ROS)^2}{R_{mf}} = \frac{2.6 \times .5}{0.08} = 16.3$$

POROSITY (from FIGURE 1) = 25 %
CORE POROSITY = 26.2 %

$$S_w = \sqrt[n]{\frac{R_{xo}(1-ROS)^2}{R_T}} = \sqrt[2]{\frac{2.6 \times .5}{13}} = 31\ \%$$

TYPICAL LOG ANALYSIS with the gamma ray, Laterolog, and Microlaterolog. The modified water saturation equation results from connate water and mud filtrate having the same resistivity. Fig. 3.



MATHERS A-1

SAMPLE CALCULATION

ZONE C: 4088-4104

$R_{xo} = R_{mLL}$ = 3.0 Ω-m ROS = 30 % (assumed) $(1-ROS)^2$ = .5
R_m = 0.04 Ω-m R_{mf} = 0.03 r-m (Table)
R_{LL} = 9.0 Ω-m R_T (using Departure Curve for D_i = 10) = 24.0 Ω-m

$$F_1 = \frac{R_{xo}}{R_{mf}} \quad (1-ROS)^2 = \frac{3 \times .5}{0.03} = 50$$

POROSITY (from FIGURE 1) = 15 %
CORE POROSITY = 15.1 %

$$S_w = \sqrt[n]{\frac{R_{xo}(1-ROS)^2}{R_T}} = 100 \times \sqrt[2]{\frac{3 \times .5}{24}} = 25\ \%$$

SATURATION AND POROSITY calculations require selection of shale-free intervals. The gamma ray is used primarily for this purpose. An S.P. curve is a flat line with muds used here. Fig. 4.

rected for the residual hydrocarbons. The average porosity of the producing-oil interval as calculated by use of the Microlaterolog is 15 per cent, as compared to an average of 17 per cent from analysis. Thus, the calculated porosity values may be used to replace core analysis.

Calculation of Water Saturation

The calculation of water saturation is based on a variation of Archie's relationship, and may be stated as:

$$S_w = 100\ [R_{xo}\ (1 - ROS)^2 / R_t]^{1/2} \quad (9)$$

where:

S_w = water saturation in per cent

All other values previously defined.

The value of R_{xo} for the oil and gas sections of the dolomite were taken directly from the Microlaterolog. The value of true formation resistivity, R_t, was obtained by correcting the value of the Laterolog resistivity by use of the Schlumberger Laterolog Departure Curves (Document 6). Since the formation is extensively fractured and is of low permeability, the invasion diameter was taken as 100 times the hole diameter. The validity of this value was checked by use of the normal and lateral curves in a few zones where the bed thickness was sufficient.

Oil-water contact . . . In the lower section of the formation, the calculated water saturation approached 100 per cent. The core plugs from this section showed no residual oil which further indicated nearly 100 per cent water saturation. Therefore, a rule of thumb was adopted such that when the water saturation calculated over 50 per cent, using the ROS correction, it was assumed that there had been no oil in the section originally and, therefore, the ROS correction was unnecessary. Thereupon, the calculation was repeated with the ROS correction eliminated. This rule corrected discrepancies that were evident when calculating saturation using the ROS correction in a water zone.

Observing Tables 1 and 2, the cal-

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culated saturations are of reasonable value for their structural position above the water zone. The values gradually increased with depth until the oil-water contact is reached. This contact is not sharply defined, but varies between —998 and —1,021 ft.

Minimum water . . . If the values of calculated saturation are plotted versus depth from sea level, an interesting curve is evident (Fig. 2). Extrapolating the curve to a higher structural position (shallower depth), an asymptotic value of water saturation becomes apparent. This value approximates 22 per cent and is conceivably the limiting connate-water saturation in the gas cap. As a check on this limiting connate-water value, a capillary pressure test was made on cores from this formation. From these capillary pressure data, a curve of water saturation vs. depth was developed and is also shown on Fig. 2. The agreement of the data obtained by two completely different methods is considered to be very good.

The calculations compared to drill-stem-test data show that when the formation interval calculated 40 per cent or less water saturation, the zone will produce oil or gas. Saturations above 50 per cent are primarily water producing and those between 40 and 50 per cent are transitional.

Choosing permeable zones . . . Those intervals selected for computing saturation and porosity and are relatively shale free. The gamma-ray curve was extensively used for selecting these intervals. The presence of shale would reduce the true resistivity value as indicated by the Laterolog. Without the gamma-ray log, the low Laterolog resistivity could be mistaken as indicating a water section.

Occasionally, as in the lower section of the dolomite of the 1 Gay well (Fig. 3), when the gamma-ray log fails to indicate appreciable shale, the low Laterolog resistivity, sometimes less than the Microlaterolog resistivity, indicates a water section. When the Microlaterolog resistivity is higher than the Laterolog resistivity it indicates that the formation is not only saturated with salt water, but that the mud filtrate is less saline than the formation water. The filtrate is present in the invaded zone and is measured by the Microlaterolog while the Laterolog current penetrates farther back into the formation and will, thus, measure the more saline water-saturated formation.

In most of the wells logged in Quinduno field, the Laterolog and Microlaterolog gives values that are about the same below the oil-water contact. This indicated that the formation-water resistivity was the same as the mud and/or mud filtrate resistivity. This observation was borne out by the S.P. curve as previously discussed.

Log analysis direct . . . The results of the saturation calculations, Tables 1 and 2, indicate that by using the Microlaterolog, the Laterolog, and the gamma-ray curve, values of saturation for intervals 4 ft. or greater in thickness can be calculated. The selection of these values require only the absence of shales and is straightforward, as shown on the included sample logs (Figs. 3 and 4). Intervals with high Microlaterolog resistivities indicate dense, low-porosity rock. Intervals with medium and low resistivity are of maximum interest. This applied to determining perforating intervals, also.

With the present knowledge of the gas-oil and oil-water contacts of the reservoir, the proper application of saturation and porosity calculations eliminates the necessity for coring the formation to determine testing and perforating intervals.

Porosity from Radioactivity Logs

Many investigators have shown that the neutron log may be used as a quantitative tool for the determination of porosity in some cases.[6] This interpretation of the neutron log is based on the fact that the instrument responds predominantly to hydrogen nuclei concentration per unit volume. If the fluid filling the pores is either oil or water, the curve should be an indication of porosity, since both oil and water have practically the same hydrogen nuclei concentration per unit volume.

On the other hand, dry gas has fewer hydrogen nuclei per unit volume than oil or water. This fact, coupled with the presence of gas in most of the producing section in this field, prevented the use of the neutron log for porosity determinations.

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Acknowledgment

The author wishes to thank the personnel of Phillips' production department's reservoir-engineering section for assisting in the preparation of this paper.

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BOOK

PETROLEUM PRODUCTION ENGINEERING—Oil Field Development, Fourth Edition. By L. C. Uren. Published by McGraw-Hill Book Co., Inc., 330 West 42nd Street, New York 36. 792 pp., $12.

This book is concerned with the technology of engineering problems involved in the development of oil and gas fields, particularly with drilling methods and equipment. It is one of a series of three volumes, each of which covers a different phase of petroleum production engineering.

Many hundreds of technical papers have been reviewed in collecting material for this volume. The author also has drawn upon information gained in supervising many petroleum-technology research projects and upon experience and professional contacts with the petroleum industry.

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The first two chapters deal with properties and occurrence of petroleum, principles of oil-field development, general drilling features, and cable drilling. Several chapters are devoted to rotary drilling. Casing factors, exclusion of water, fishing, well logging, well surveying, well records, and well completion methods are discussed in other chapters.

CONVERSION TABLE CORRECTION

Correction of the set of conversion factors which appeared on page 137 of the April 2 issue should be made as follows:

This . . .	. . . times this	. . . gives this
Bbl./day (42 gal.)	1.75	g.p.h.

The table erroneously listed the conversion factor as 1.7298.

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CONTINUOUS AUTOMATIC SAMPLING—3

Don't Sell Sampling Short

Purpose of the articles in this series is to point out that the use of automatic sampling devices may provide the means for obtaining truly representative samples, thus eliminating inaccuracies existing in those obtained manually. If these results are gained, potential errors due to the human element involved in present manual procedures will be removed.

R. P. Johnson

THE most important realization for accurate sampling is the elimination of wasted time, effort and cost, not only in the sampling operation itself, but also in the subsequent testing of a sample that is not truly representative. Accurate sampling is the key to success of all inspection and testing efforts.

Application of Automatic Sampling

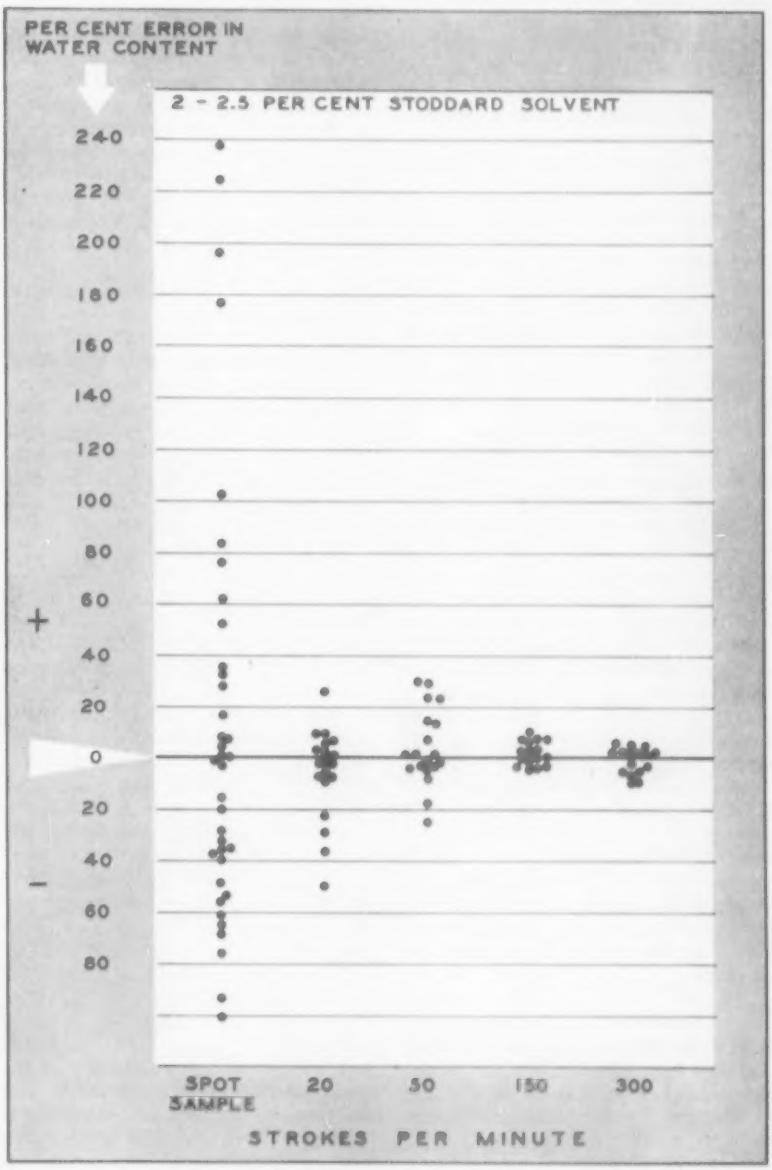
In the following applications of automatic samplers to storage, handling and processing operations, it is frequently indicated that the accuracy of automatic sampling is superior to that of manual sampling. Obviously, if a sufficient number of manual samples are taken and these are composited, the results from an accuracy standpoint would tend to approach those of an automatic sampler.

However, reciprocating types of automatic samplers today can operate at a speed of as much as 300 s.p.m. This rate of sampling cannot be duplicated by manual methods.

I have included a chart indicating the accuracy of manual samples versus those taken automatically of a petroleum product containing a known quantity of water. Results of this test are plotted in Fig. 1. It is apparent that for the single manual samples, the percentage error in water varied from 100 per cent minus to 240 per cent plus.

With automatic samplers operating at 20 s.p.m., the range in these errors decreased tremendously and at rates from 150 to 300 s.p.m., the percentage deviation was approximately ±10 per cent. This is an indication of the considerably greater potential accuracy which may be obtained by the use of an automatic sampler.

Author is with Socony-Mobil Oil Co., New York. He was assisted in the preparation of this article by L. G. Carlson, Claremont Instrument Co.; E. L. Hoffman, Socony-Mobil Oil Co.; L. Lowy, B.I.F. Industries, Inc.; and H. F. Tapp, Gilbert & Barker Manufacturing Co.



SAMPLING ACCURACY, manual sampling as compared with automatic sampling of a petroleum product containing a known amount of water. Fig. 1.

Pipeline use . . . Crude oils are accumulated in lease tanks or gathering tank farms or systems for transmission by pipeline to refineries and terminals. While the lease tanks are sampled manually, the refineries receiving the crude oil base all their computations on results of tests of samples from the pipeline.

If an automatic sampler is installed in the pipeline at the refinery, all necessary data can be obtained accurately and promptly. Since the price of crude oils usually is based on gravity and net "clean" oil, it is essential that the sample is a true indication of the quality of the volume involved.

In the case of refined-product pipelines, wherein different products are moved, installation of automatic samplers at source terminals or refineries would eliminate the need for manual spot samples in storage tanks. Not only would the samples be more representative of the tank contents, but contamination and degradation of product could be detected quickly.

Also, the quality of samples required for special tests of adherence to specifications is assured. The use of automatic samplers in the line at the receiving point would provide representative samples of products flowing into the terminal. However, manual spot samples must be taken to determine if the products have been received into the assigned tankage.

Accurate crude samples . . . The use of automatic sampling devices would be an important adjunct for obtaining accurate samples of crude oils and products at shipping and receiving ports. With such a unit installed in the dock line, the shipper would be aware of the quality of the volume loaded. Stratification of crude oil and products in shipping tanks and excessive b.s. and w. in crude-oil tanks, which may not be found by spot samples, would be disclosed by using the automatic device.

On imports of crude oils, declarations of quantities on which duty must be paid are affected by the b.s. and w. content. In those cases where tests of samples indicate more than 1 per cent, an allowance for the excess is approved by the U. S. customs. Hence, the accuracy of the sample is of prime importance.

Marine equipment . . . Operational difficulties on marine equipment can cause contamination and degradation of cargoes. Samples taken prior to the start of discharge might show that everything is in order on the vessel. However, during the discharge period, some condition may arise which, if not detected promptly, would not only contaminate the ship's cargo, but would also contaminate the contents of the shore tank.

Automatic sampling devices installed in each dock line could be regulated to permit samples to be taken at selected intervals for testing, thus providing the basis for quick detection of potential contamination. For example, if No. 2 fuel oil is being discharged and an interval sample taken from the sampling device shows a low flash, it will be evident that contamination has ocurred and pumping can be stopped immediately to determine the cause of the contamination.

In the case of crude-oil shipments, it has been found that residues from previous cargoes have influenced the b.s. and w. found prior to discharge. When the tests of the samples secured automatically show that this percentage is higher than that reported by the loading port, it may be that the condition of the vessel caused the increase. In such instances, having accurate samples at both the loading and receiving ports, the carrier could be asked to conduct an investigation which might prevent recurrence of this condition.

Processing . . . The installation of an automatic sampling device in manufacturing processes would provide better process control thus minimizing costly shutdowns and needless changes in operating conditions. For example, such a device can be used to obtain continuous line samples on "in-line" or tank blending of components and additives and samples of the final blended product.

There are many cases where a single manual sample will not be representative of the product throughput. It may indicate conditions only at the instant the sample was taken. In such a case, even a slight deviation from specifications may be interpreted as a need for a costly change in operating conditions. An automatic sampler operating for periods as long as desired would give a representative sample (Fig. 1).

While a manual sampler can also be used for proportional samples by taking many samples, its use under these conditions would be less accurate, cumbersome, and time consuming. For control purposes, multiple tank-car loadings or package fillings of one material may be sampled by a single automatic unit installed in the line from the storage tank.

The construction of most automatic samplers provides for flexibility in the application to specific operations. For example, in the case of tank-car and package fillings, the time interval and size and number of samples to be collected can be regulated to meet the sampling need.

Installation

Any company installing automatic sampler equipment expects, and justifiably so, that the equipment will operate efficiencly with a minimum of maintenance. Personnel installing this equipment must be provided with detailed installation instructions by the manufacturer. In some cases, petroleum - company equipment specifications may be more stringent and a better guarantee of foolproof performance. Installers must understand and strictly adhere to these specifications if the desired results are to be achieved.

Here are certain basic requirements for the efficient operation of the device:

1. Locate the sampler as close as possible to the pipeline, preferably less than 25 ft. To minimize the time lag between the liquid flowing through the pipeline and the sample being collected, the connecting line from the pipeline tap to the sampler should be as short as possible.

2. Avoid areas of vibration from high-pressure lines. To correct this condition, it may be necessary to install some type of shock-absorbing connection.

3. Install lines and sampler so that the bypass steam is turbulent as it travels through the sampling unit. This would prevent the dropout of immiscible products and heavy particles.

4. The unit selected and its installation should be such as to permit manual purging of the system at desired intervals.

Operation

One of the basic installation requirements for efficient operation is that means should be provided to purge the sampling system. This is important because the samples must not be contaminated by liquids remaining in the system by previous movements. Also, the purging operation would indicate whether the system was clear and functioning properly.

Depending upon the unit selected, purging may be accomplished in various ways. Some units are designed so that by manipulating an internal valve, the system is purged automatically. In other units, this operation is not automatic and requires that a valve in the sample tap line be opened to permit flow of liquid through the tap line to the sampler.

Then a valve on the discharge side of the sampler is opened. The full pressure of the main pipeline forces liquid through the tap line and sampler, thus purging the system. If the pressure in the main pipeline is not sufficient to force the liquid through the sampling system, an auxiliary pump must be used to complete this operation.

Activating . . . After purging the system and determining that the unit is ready for operation, the following steps are taken to activate the device:

1. Suitable containers (size, pressure or nonpressure) are placed in position or attached to the sample carrier.

2. Inlet and outlet valves should be opened.

3. For units operating at a set speed, the operator then merely applies the power element.

4. On units equipped to select sampler size and time interval, the operating control should be set at the desired position before the power is applied.

5. At the end of the sampling period, some units will shut off automatically while others must be shut off manually. It is possible with all units to remove portions of the sample at any period during the operation of the sampler.

Maintenance

Automatic sampling devices which are presently available require little maintenance to insure their efficient operation. Maintenance for the greater part would consist of lubrication of moving parts, tightening or repacking of valves, and testing, and possible replacement of tubes in electronic units.

Proper analysis of operating conditions is important in determining the frequency of inspections for maintenance purposes. Low-temperature operation with heavy viscous crude oils, containing excessive amounts of basic sediment and other foreign elements, will require more maintenance than where these conditions of service are absent or present to a lesser degree.

Being mechanical in nature, the moving parts of these units are subject to wear. The effects of these conditions should be kept at an absolute minimum. Therefore, it is essential that all users of this equipment establish an adequate inspection program to determine when maintenance or repairs may be needed. The frequency of inspection would be based on the volume sampled and the type of liquid sampled.

Testing . . . As these units are, in a sense, meters calibrated to a very close tolerance, they should be tested at stated intervals to determine if they are collecting the quantities required. One type of simple test can be made under actual operating conditions by allowing the liquid sampled to flow for a short period of time into a calibrated container.

The results of such a "quantity test" may indicate the need for a more careful "quality test." To accomplish this, inject a known quantity of a mixture of crude oil and water or product and water into the sampling system, and collect it in a calibrated container. Keep the mixture in a turbulent state at all times including the original container from which the mixture is pumped through the sampler system.

Comparison of the injected quantity with the quantity and quality of the sample collected in the graduate will indicate the accuracy of the unit. Suitable connections to the sampling system must be provided in order to make such a test.

Summary

The increasing trend to purchase crude oils and refined petroleum products to closer specification tolerances indicates the need for more accurate sampling of volumes handled.

Automatic, mechanically efficient, and accurate samplers have been developed by the manufacturers working with the petroleum industry. From all indications to date, the use of automatic sampling devices, if properly installed, operated, and maintained, will provide the industry with samples that will exceed the accuracy of those obtained manually.

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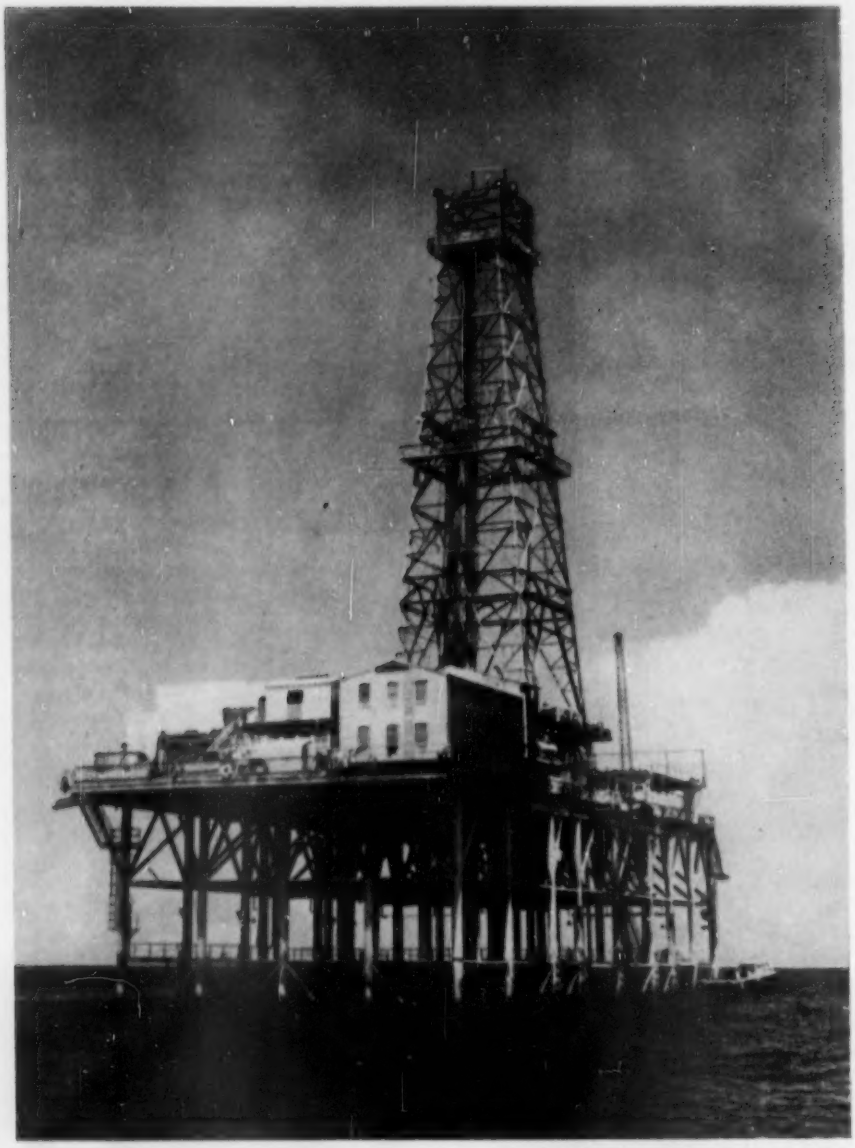

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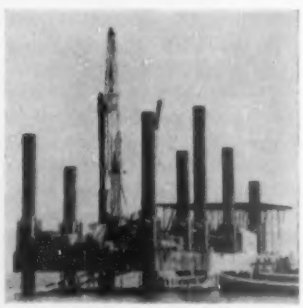

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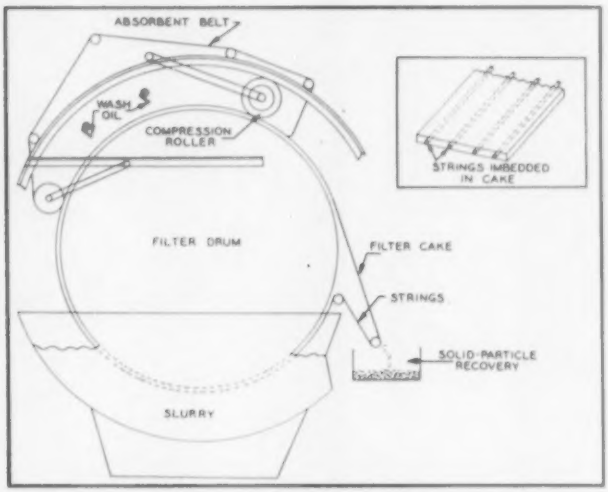
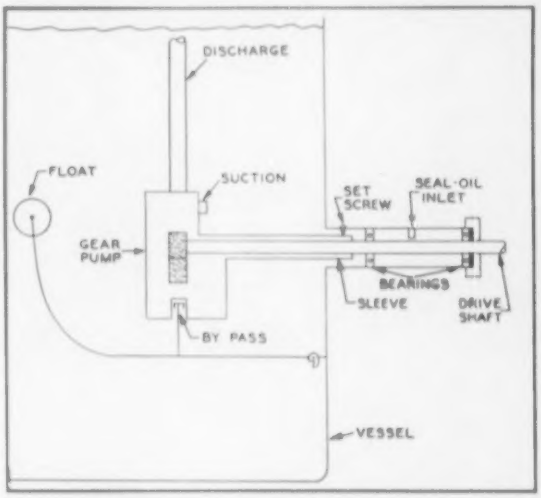
FOREIGN LICENSED MFR.: Oil Well Engineering Co., Ltd., Cheadle Heath, Stockport, England



STRINGS riding the surface of filter drum become embedded in caked catalyst, causing it to break off in the recovery tray. Fig. 1.



AUTOMOBILE lube-oil pump handles hot, viscous liquid. Level is controlled by float acting on bypass valve. Fig. 2.

Solving petrochemical-plant problems

. . . here's how Cosden Petroleum did it at its Big Spring, Tex., refinery

by Larry F. Resen
District Editor

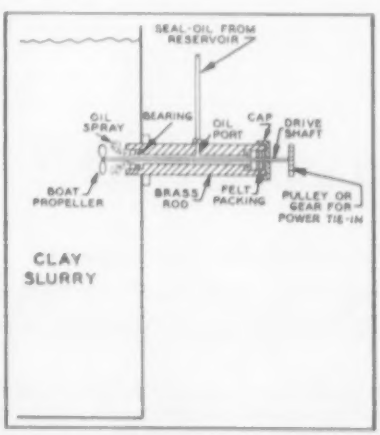
SEVERAL interesting petrochemical operations[1] are being conducted at Cosden Petroleum Corp.'s Big Spring, Tex., refinery. For example, the plant's organic-chemicals division has to handle continuous batch operations, resinous materials, and slurry filtering.

Filtering . . . In one particularly troublesome phase of resin production, a slurry consisting of clay catalyst and filtrate containing soluble resin had to be separated. But most of the filtration methods commonly used proved impractical. The clay had a tendency to "cake up" when liquid was removed, and the cake could not be removed easily from the filter drum by the usual doctor-blade method.

This problem was solved by use of a pilot-plant-size string filter (Fig. 1) produced by Filtration Engineers, Inc. This drum-type filter has three features that make it highly desirable for this operation: a wash-oil system; an absorbent compression belt; and the string feature.

In the filter operation, several parallel strings ride on the drum surface throughout its travel. As the vacuum system picks up the slurry, it causes a cake to adhere against the drum surface. And, in effect, the strings are imbedded in this cake.

As the travel of the drum continues, an overriding absorbent belt comes into play. This belt, which rides over the topmost travel arc of the drum, is held firmly against the drum—and the cake—by compression rollers. Its purpose is to squeeze liquids out of the cake into the vacuum liquid-recovery system.



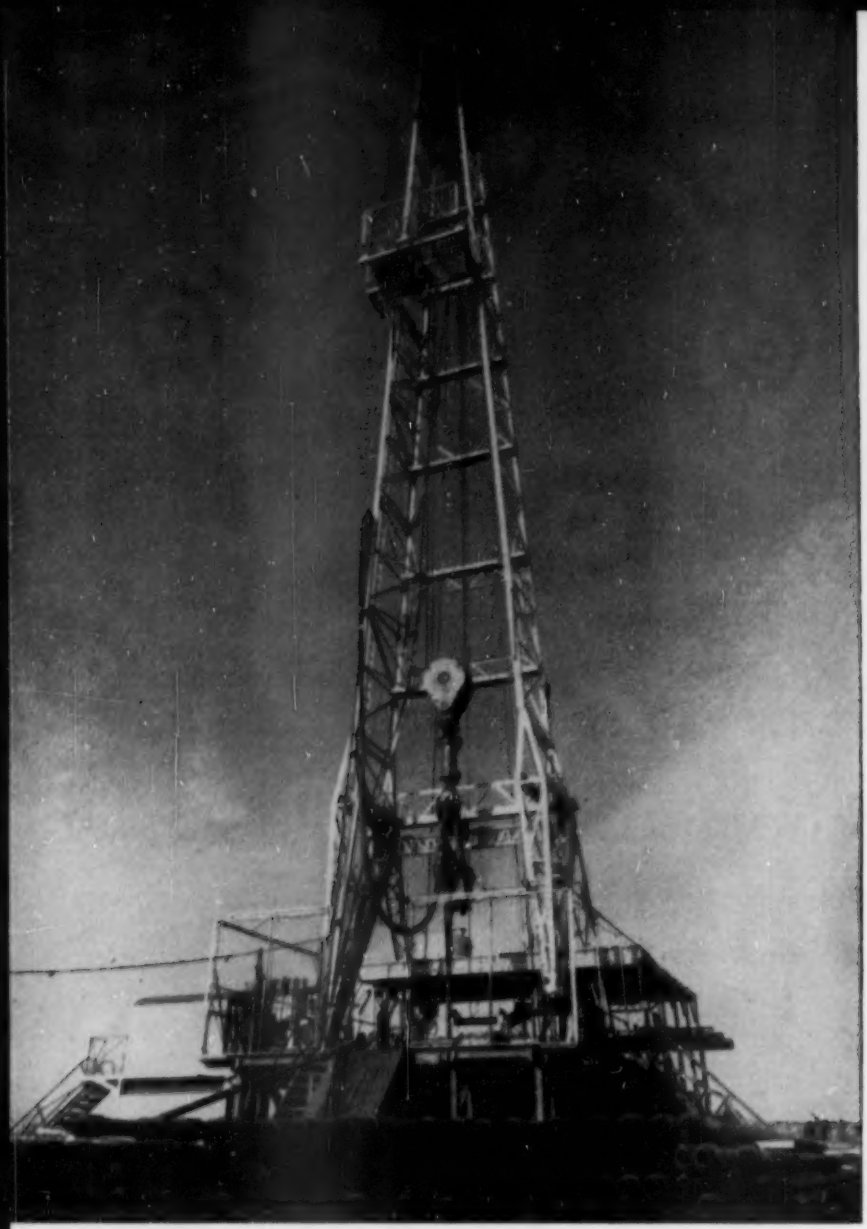
SEAL OIL under pressure sprays inboard bearing of this clay-slurry mixer, preventing bearing failure from abrasive mixture. Fig. 3.

Since there is soluble resin remaining in the cake, the absorbent felt is washed with fresh oil (or system distillate) which aids in the recovery of the resin within the filter cake. This compression phase helps to make the cake even more compact—and this is where the string comes into play.

The cake begins its downward arc after passing under the compression belt. The strings extend outward away from the drum in this last quadrant of travel. Next they pass over rollers, and then are directed back against the drum to repeat the cycle. As the strings pull away from the drum and then reverse direction on the rollers, the cake in which they are imbedded breaks up and is collected in a catch pan.

The action of the strings is such that the surface of the filter drum is left clean. Meanwhile, the resin-oil solution is accumulated and then flashed, with the oil content being returned to the refinery for further processing.

Pumping . . . Here's an internally mounted and controlled pump that has brought troublefree operations of a processing vessel in resin production (Fig. 2).



Designed for speed in drilling, this rig drilled 7,400 ft in 16 days at a location near Lindsay, Oklahoma. Carrying 40,000 lb of weight at the bit, it was pumping 641 gallons of mud a minute at 1,800 lb pump pressure to pulverize sand and rock and increase the drill's boring speed.

Roughnecks stab the tool joint into the waiting end as another length of drill pipe goes into the hole.

Power-Play For Oil

Mercury Drilling Company—searching for new reserves —uses one of the most powerful rigs ever built to thrust Pittsburgh Steel Company drill pipe into the earth.

Packing all the controlled power of a diesel locomotive, Mercury Drilling Company's Rig No. 2 is a giant among the nation's rotary drill rigs. This herculean rig, with its 142-ft high derrick now working in the oil-laden Golden Trend sands of Oklahoma, can bore its jet bits into the earth at rates up to 1,000 ft a day. It can bullseye a one-foot diameter target more than three miles underground.

Equipped with three 870 hp engines and three of the largest torque converters built, it can supply more than 2,400 hp to drive the rotary table and mud pumps. Its block, weighing nearly 8 tons, was specially designed for the rig.

Compact design throughout and a portable mud tank system give the rig mobility. On completing a hole, it can be knocked down, transported to a new location, set up and be drilling again in less than 2½ days with favorable weather.

When you have an investment of over a half-million dollars and operation costs up to $1,000 a day on a rig such as this, you can't afford to waste time.

Every feature of Mercury No. 2 is built for speed. From the power needed to carry heavy bit weight-loads, to the automatic slips for going in and out of the hole, it is equipped to drill more footage faster and more efficiently. Its mobility reduces down time between jobs.

Quality of the equipment and swift supply service are also essential to reaching pay fast. Here again Mercury saves time and expense.

This rig with all its equipment —including Pittsburgh Steel Company's seamless 4½ in. OD

Drill pipe, being measured in the rack, is fed into the hole length by length as the hole deepens. On a rig such as this it must withstand severe tension, compression, torsion and fatigue stresses as well as abrasive wear.

Grade E Range 2 drill pipe—is supplied by one of the independent distributors listed at right. Already a pace setter, it is hungrily churning after new footage records.

When operations must move fast, oil men with a lot at stake prefer the services of these distributors. Here's why:

Independent distributors are ready for action. Even the smallest item of equipment is available to your rig 24 hours a day, seven days a week. Well-stocked supply stores mean equipment can be on hand at the rig with least delay. You can count on them in emergencies.

Their service is flexible. The independents are personal friends to oil men they serve. Through long experience, they know the problems and can meet requirements without red tape and extra paper work. They are free from remote control and can make big decisions without wasting time.

Independent distributors help keep costs low. With all the extra service available, they keep their prices competitive. They can do this because of low overhead, and because their livelihood depends on meeting competition. The return Mr. Independent makes in business stays at home.

Their equipment is the best. Being independent, these distributors are free to select from the best equipment made, on the basis of performance and customers' requirements. They are backed by reputable manufacturers—such as Pittsburgh Steel Company, a producer of high quality seamless oil country goods for more than half a century.

Independents are accessible. The distributors at right have 141 stores covering all major oil fields in this country and some abroad. Yet each distributor individually concentrates his services in the home areas he is best qualified to serve.

Next time you need a string of drill pipe, casing or tubing, get the pipe of your choice through the distributor of your choice! Specify Pittsburgh Seamless!

For Fast, Personal Service

—these independent distributors who carry Pittsburgh Seamless drill pipe, oil well tubing, and casing are ready to meet your requirements.

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18 Harrison Street
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C. W. Cotton Supply Company
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Franklin Supply Company
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Houston Oil Field Material Co.
1524 Maury Street
Houston, Texas

Industrial Supply Company
500 Eighth Street
Wichita Falls, Texas

Iverson Supply Company
400 West Fifth Street
Tulsa, Oklahoma

Lucey Export Corporation
233 Broadway
New York 7, New York

Lucey Products Corporation
624 South Cheyenne
Tulsa 19, Oklahoma

McJunkin Corporation
P. O. Box 513
Charleston 22, West Virginia

Midland Supply Company
Box 3105
Washington St. Station
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Mountain Iron & Supply Co.
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Murray Brooks, Incorporated
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The particular vessel operates under vacuum at elevated temperatures. The product being pumped has a high viscosity and requires high temperatures to enable it to flow.

Installation of an external pump would have meant the undesirable use of jacketed equipment. Likewise, use of a kidney float for liquid-level control would have meant special fittings and packings.

An inexpensive method was devised to solve this problem. An automobile-engine lube-oil pump, available at any automotive shop, was mounted within the vessel. The pump is shaft-driven by an external motor with the shaft extending through a housing which was machined at the plant. Since the vessel operates under vacuum, a seal-oil system is used on this housing. If leaks develop, oil rather than air will enter the vessel so that the vacuum is not affected. A float is also installed within the vessel, and this controls the action of a bypass valve to maintain desired levels.

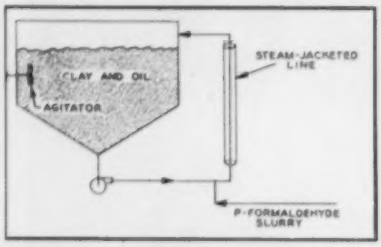
Under these conditions, the pump always remains at the vessel temperature, and there is no tendency for the product to solidify within the gear-type pump due to an insulation break (such as might be the case if it were mounted externally).

Shaft housing . . . In both the above cases and other similar instances, the method of housing the drive shaft deserves comment. On the drive shaft for the pump (Fig. 3), it was desirable to provide a seal-oil system because the vacuum operation would naturally be impaired if air leaked into the system.

In another operation, a drive shaft is used on a propeller which agitates a clay slurry. In this installation, the incoming seal oil is used to provide an oil spray around the shaft bearing. This prevents the abrasive slurry from coming in contact with moving parts.

In both instances, a brass bar was machined to provide a hollow center large enough to accommodate the shaft. A seat was then hollowed out on both ends of the brass stock. A ball bearing and retainer was fitted into the inboard end of the bar which extends slightly into the vessel. (A deeper seat on the outboard end provides room for the bearing, retainer, and felt packing). A cap is then screwed on the end to hold the packing in place. And, finally, an oil port was drilled so that seal oil from an elevated reservoir could enter and surround the shaft and bearings.

The entire housing is permanently fastened to the vessel. Fresh feed is used because the seal oil and the gravity flow maintain a large enough differential to prevent slurry from causing undue wear on the bearings and shaft (or to prevent air from entering the vacuum system).



A HEATED LINE and injection of p-formaldehyde into recirculating line solved foaming problem. Fig. 4.

Continuous feed . . . An interesting sidelight on the resin production was the adoption of a continuous-feed system in the initial reaction step. The over-all process scheme was initially a batch operation quite common to chemical manufacturing.

Fresh feed, plus paraformalydehyde and a clay catalyst, were added together in a large agitated-reaction kettle. The clay and p-formaldehyde were dumped into the kettle. Water agitation formed below the surface caused considerable foaming as the reaction proceeded. This foaming was aggravated because the p-formaldehyde would drop below the surface and foaming would be generated from below up through the agitated slurry in the kettle.

Making the process semicontinuous, this foaming was eliminated. The clay and oil are fed into a pump system and the resultant slurry is pumped into the agitated-reaction vessel (Fig. 4).

A pump then circulates from the bottom of the reactor through a steam-jacketed heating line back into the reactor above the liquid level. Paraformaldehyde slurry is slowly injected to the reactor at the inlet of the steam-jacketed heater.

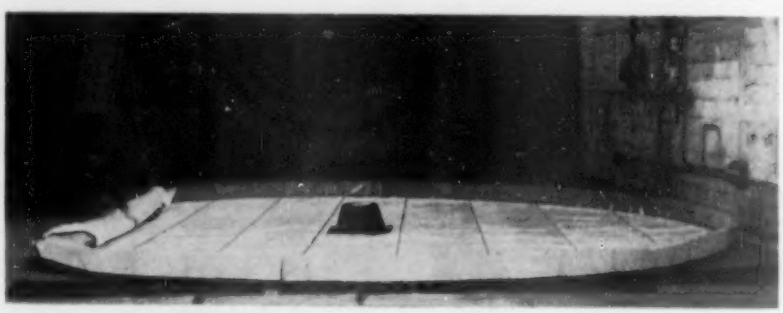
First the clay is added and the agitating mixture of oil and clay is brought up to reaction temperature. The p-formaldehyde slurry is slowly added into the discharge of the reaction-vessel circulating pump. Reaction begins as the mass moves upward through a section of steam-jacketed pipe and back into the reaction vessel above the liquid level. Most of the reaction takes place in the heated line.

Reaction is rapid and gives off water vapor. If the p-formaldehyde is pumped into the reaction vessel, the water of reaction evolved below the surface results in excessive foaming. Utilizing the procedure above allows the water vapor to separate from the reacting mixture without foaming.

Acknowledgments . . . Cooperation of the management of Cosden Petroleum Corp. in the release of this material, and W. K. Jackson in its preparation, is hereby gratefully acknowledged.

Reference

1. Jackson, W. K., and Krausse, D. M., "How a Small Company Got Into Petrochemicals," The Oil and Gas Journal, July 4, 1955, p. 102.



This plastic "blanket" checks tank vapor loss

HERE'S a new floating plastic blanket made of unplasticized polyvinyl chloride. It has been used in France to reduce vapor losses 80 to 90 per cent from storage tanks containing crude and refined products and chemical solvents.

On its underside, this blanket consists of a large number of parallelepipedal floats. To seal around the edge of the blanket, a skirt is provided to contact the tank wall. Standard Oil Co. of Ohio is currently testing the blanket in two storage tanks.

The plastic blanket is a development of Laroche Freres, Paris, who are represented by W. K. Archer, 75th and Cleveland, Kansas City, Mo.

Dowell engineers blend F.L.A. (Fluid Loss Additive) with the fracturing fluid in 10,000-gallon, skid-mounted paddle mixer.

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F.L.A.* (Fluid Loss Additive), a petroleum derivative exclusive with Dowell, substantially lowers fluid loss when added to your fracturing medium. F.L.A. forms a film on the formation face to prevent fluid loss. This promotes longer fractures and deeper sand penetration. It means greater production and slower decline for your well.

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Ask Dowell engineers to use F.L.A. in your next fracturing job. They'll tailor the treatment to fit the well giving you maximum control of fluid loss.

For more information or service, call any of the 165 Dowell offices in the United States and Canada; in Venezuela, contact United Oilwell Service. Or write Dowell Incorporated, Tulsa 1, Oklahoma, Dept. D-11.

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Latest in Mobile Drilling Platforms Goes To Work

by Ed McGhee
District Editor

THE SCORPION is shown here, on location and ready to start drilling. It's now at work near Port Aransas, Tex. The drilling rig, as seen from the deck of the Scorpion, is seen in the photo at bottom of page.

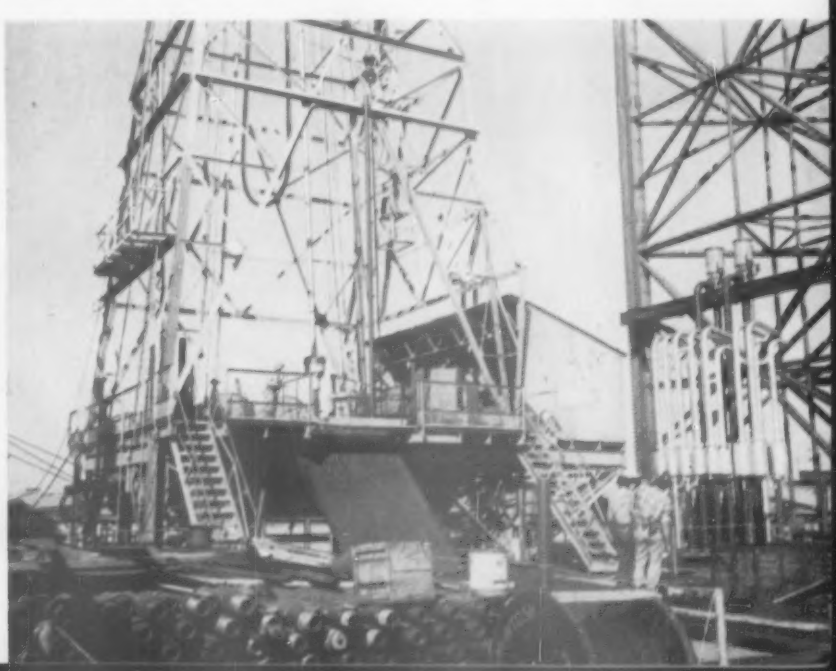
Newest addition to the fleet of mobile drilling platforms operating in the Gulf of Mexico is the "Scorpion" of Zapata Offshore Co. The three-legged structure was commissioned in March and is now drilling in the Port Aransas, Tex., area. A completely self-contained steel island weighing 9,000,000 lb., the Scorpion represents an investment of about $3,000,000 and a new idea in design. This article describes the platform and the drilling equipment on it.

LATE in 1954, Zapata Off-Shore Co. contracted with R. G. LeTourneau, Inc., to build a large deep-water drilling platform. The design called for a floating barge with three electromechanical-powered spuds or legs. The legs were to be lowered to ocean bottom and the platform self-elevated on them.

During the past year, the platform was built at Vicksburg, Miss., on the river banks. When construction was well along, the unit was moved into the water for final touches and testing of the raising and lowering apparatus. It was then towed to Galveston, fitted with drilling equipment, christened the "Scorpion," and put to work.

The Scorpion is now drilling for Standard Oil Co. of Texas in the Port Aransas area. Water depth at this first location is only 46 ft., but the unit is designed to operate in depths up to 80 ft. with normal penetration of the spuds into the ocean bottom. With no penetration, the operation depth would be extended to 100 ft. of water. The bottom of the hull at maximum water depths is 20 ft. above the surface, and the deck is 40 ft. above.

(More on page 132)



DRILLING

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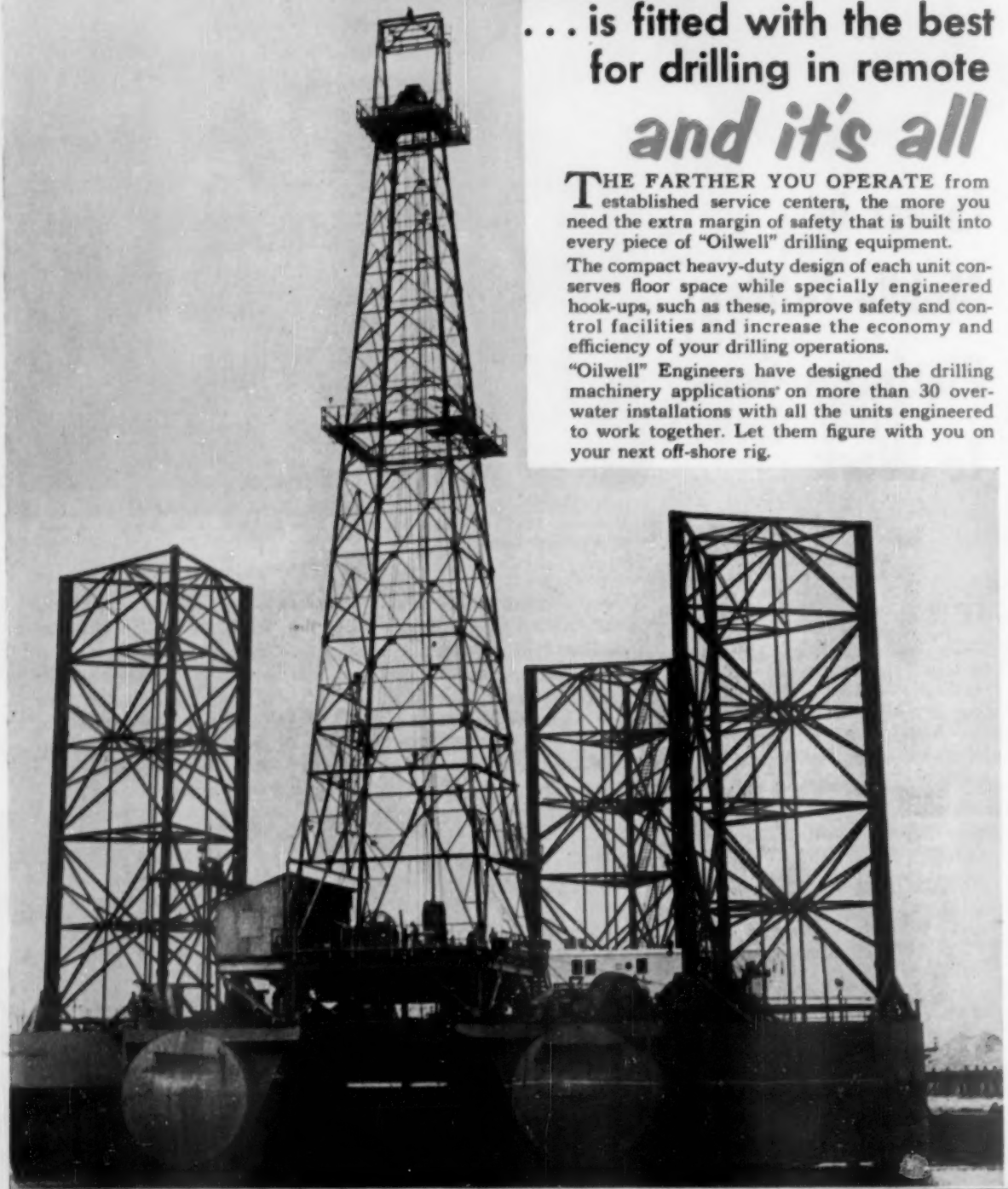
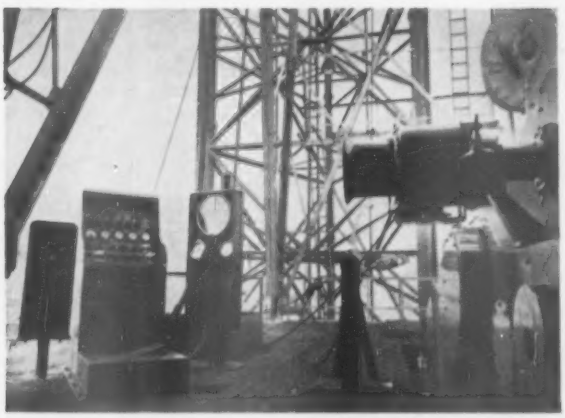


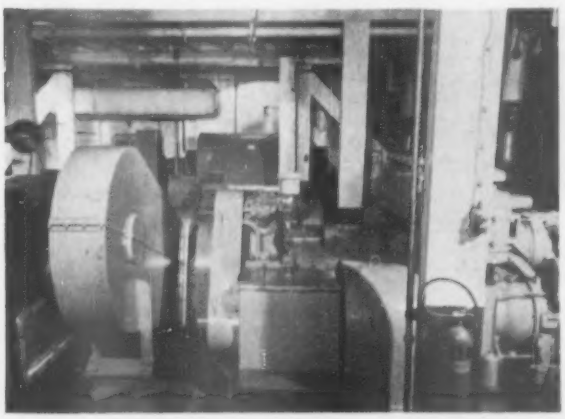
UNITED STATES STEEL

Mobile Drilling Platform

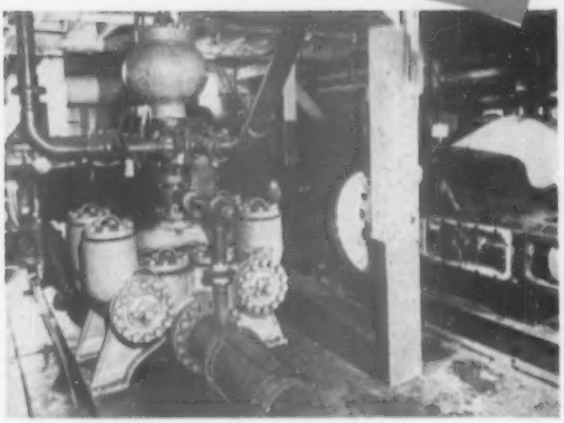
equipment you can buy off-shore locations "Oilwell"!



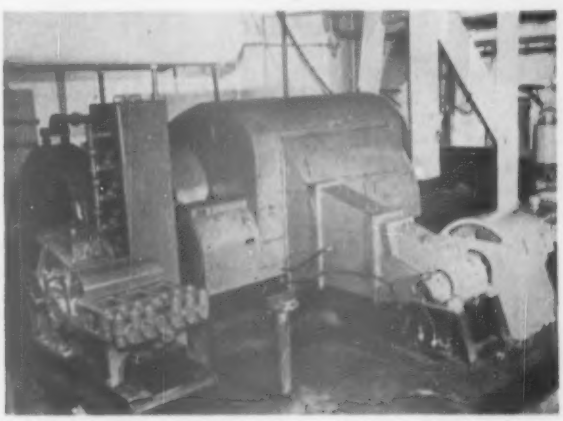
From this derrick-floor console, the driller controls the engines, pumps, automatic feed control, and hoisting facilities (all located below deck) as well as catworks controls for the rotary table and catheads. An operator at the catworks is needed only for sand line spooling.



The No. 96 Draw Works is powered by a No. 1500 Four-Engine Drive and is located in the hull, protected from salt spray. Weight and space are saved by using deck-pad mountings instead of skidwork. Clutches are gap-mounted to facilitate replacement.



Two No. 818-P Slush Pumps provide ample volume-pressure capacity for deepest drilling. Their narrow width and low weight per horsepower, make them perfect for compact over-water work.



The No. 15 Drilling Control provides close and automatic regulation of weight on the bit. This not only increases penetration rates but also affords unique advantages in directional drilling common to off-shore operations.

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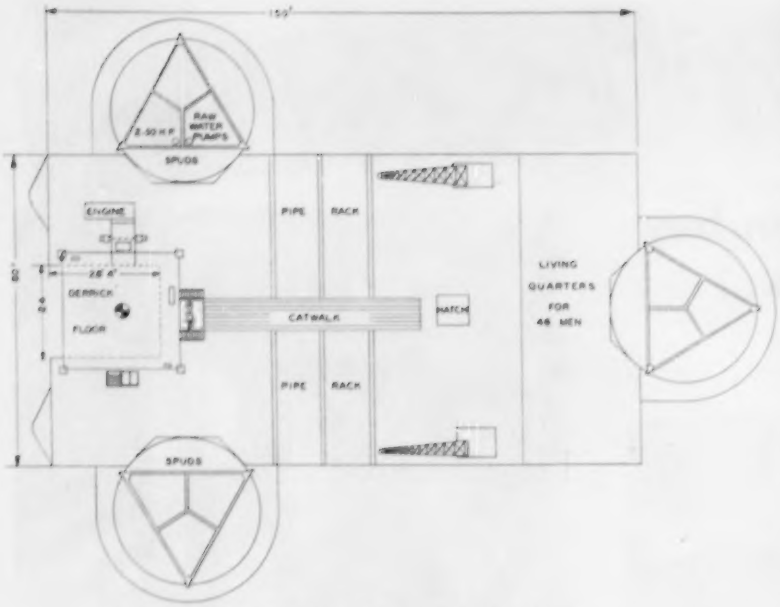
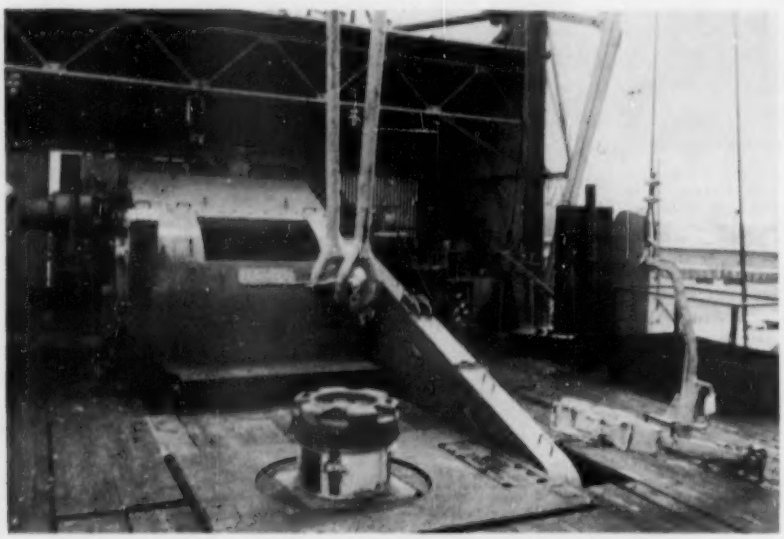
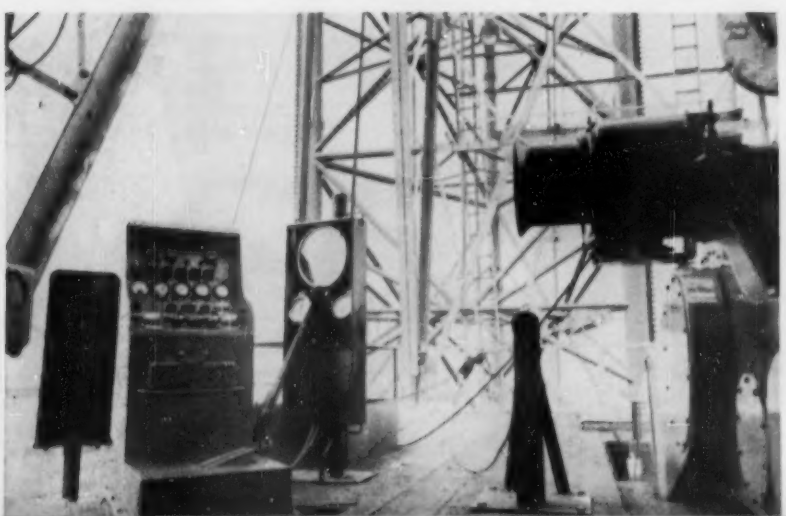


MAIN-DECK PLAN of the Scorpion. Fig. 1.



DRILLING EQUIPMENT, above and below, located in the derrick area.



MORE ON . . .

Mobile Drilling Platform

Horseshoe cylinder . . . The barge structure is of tubular and corrugated design for most strength and stability and least weight and internal bracing. Three tubes, 20 ft. in diameter and in horseshoe shape, form the basic hull. These are joined by the center section, which has a corrugated bottom. Tubes and center section are divided into compartments by bulkheads, decks, and watertight doors. Construction is all welded steel.

Various compartments provide storage space for mud, fuel, drilling water, and drinking water. The barge's design also allows putting most drilling equipment below deck where it is protected from salt-water spray. If the equipment were atop the deck, housing would have to be erected for it—and this would increase wind resistance.

The barge portion itself is 150 ft. long, 80 ft. wide and 20 ft. deep. Adding the spuds (or legs) and spud housings outboard on the two sides and on the aft end, over-all dimensions become 186 ft. by 150 ft. Figs. 1 and 2 show the arrangement and size of the platform. Equipment used in constructing the platform is listed in Table 1.

Legs have gear racks . . . Gear racks are a part of the upright members which form the three corners of each triangular-shaped leg. Seven electric gear motors power the pinions that drive these racks (as shown in Fig. 3). With three racks per leg and three legs, there are a total of 63 synchronous but independently operating motors that raise or lower the legs.

Each motor has a gear reduction of 1,000:1, and together the motors can raise the barge at a rate of 1 ft. per minute. Moreover, each motor has integral motor-load brakes that set mechanically when electric power it cut off, and release electrically when power is applied. These gear motors are easily accessible through watertight hatches on the deck.

The 140-ft. legs are of open design and are truss-braced to keep down wind and wave resistance. A pontoon tank forms the lower end on each leg. And gear racks on the legs extend down onto the pontoons to permit raising them into the spud wells during towing.

Electric power for operating the legs is supplied by four diesel-engine-driven a.c. generators. These power units also furnish electric power for operating two 250-ft.-ton cranes and three electric winches mounted on the barge deck. The engine-generator sets are in the starboard tube, and the control

station for raising or lowering the platform is on the main deck.

In lowered position, the hull has a 4,000-ton displacement and can be towed in moderate seas. When fully loaded, the draft is about 11½ ft.

Drilling Rig

Most drilling equipment such as draw works, drilling engines, compound, pumps, and drilling-feed control are set on mounting pads on a single level 15 ft. below deck under the pipe rack. (See Figs. 1 and 2.) All skidwork not an integral part of the machinery has been left off to use hull framing for support and to save weight and space.

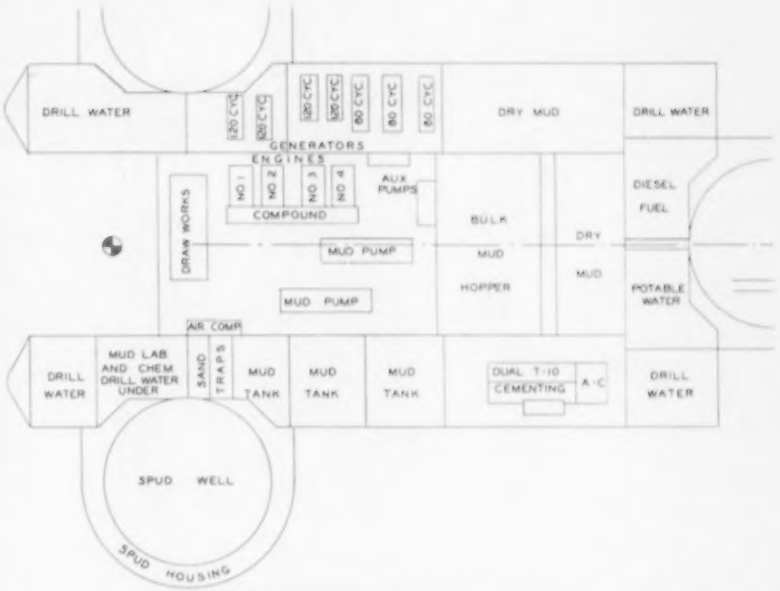
On the derrick floor—10 ft. 7 in. above the main deck and 25 ft. 7 in. above the machinery deck—there is a separately driven cat works and sand-reel unit, a rotary table, and a master console that controls all drilling. The draw works is so set that the drilling line runs up inside the derrick to one side of center. This placement avoids interference with pipe or tools brought through the "V" door.

The main draw works is a 1,500-hp. unit with 60-in. hydromatic brake and feed-control takeoff. Sand reel, rotary drive, catheads, brake hand lever, and the usual front-mounted control panel have been omitted to suit the remote location off the derrick floor. Draw-works oil-pressure gages are mounted at the rear of the draw works for easy visibility.

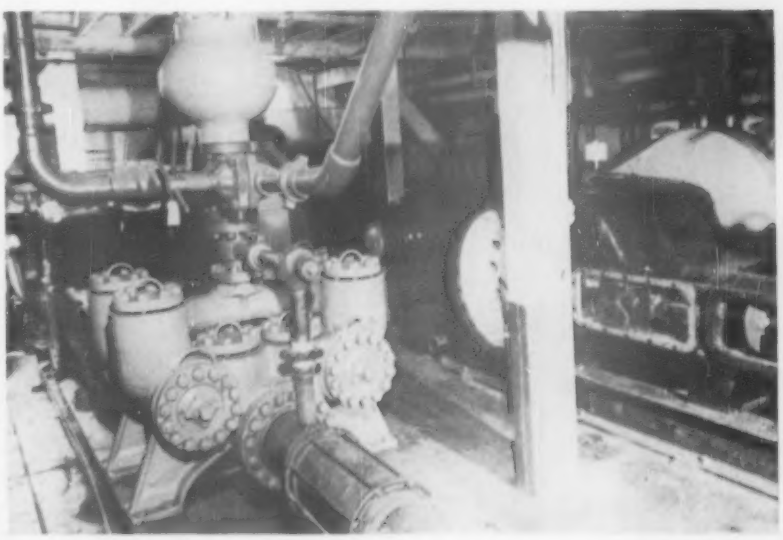
The hydromatic brake is coupled to the draw-works drum shaft through an overrunning clutch and a manual-disconnect coupling. To facilitate clutching and declutching the feed control when making a connection or round trip, the feed-control drive clutch is air-operated from the driller's position.

Compound and engines . . . Four twin-diesel engines furnish the power for draw works and pumps. These engines have dumping torque converters and jacket-cooling heat exchangers specially mounted for free passage between engines and hull bulkhead. Each engine is rated at 400-hp. continuous for driving the pumps, and at a slightly higher horsepower for hoisting intermittently.

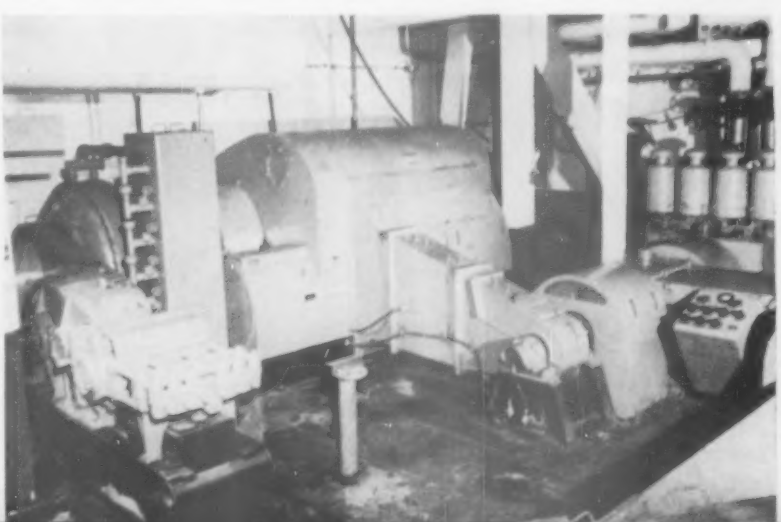
The engine compound is a four-engine drive modified with a fifth shaft mounting an airflex clutch for remote compounding of all engines for hoisting. During drilling, the two forward engines may be compounded to drive one mud pump and the rear engines may be compounded to drive the second. To change from pumping to hoisting duty, the driller has only to disengage the pump clutches and engage the compounding clutch and master clutch. This he can do easily and quickly from his post on the derrick floor.



BELOW-DECK PLAN of the Scorpion. Fig. 2.



BELOW-DECK MACHINERY, above and below. Layout plan is shown in Fig. 2.



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Any shaft in the drive can be removed vertically from the compound case. And all chains are accessible through large hatch covers over each shaft. There are also dual lubricating-oil pumps.

The master-clutch shaft and both pump-drive shafts are on pillow-block pedestals mounted directly on machinery deck pads. There are airflex disconnect clutches at all three points as well as between the engines and drive. Both pump clutches, the master clutch, and the four-engine clutches are gap-mounted so that they may be replaced without moving any machinery. Moreover, the master-clutch shaft and the rear-pump drive shaft are interchangeable to simplify maintenance.

TABLE 1—DESIGN OF PLATFORM

General

	Ft.
Length of hull	150
Length, including end spud housing	185
Width of hull	80
Width, including side spud housings	150
Depth of hull	20
Draft fully loaded (approx.)	11 ft. 6 in.
Maximum height, platform deck to pontoon bottom	140
	Tons
Displacement	4,000
Dead weight	2,000

Mechanical

Power source: Buda 8DAS-1125 engines drive direct-coupled LeTourneau a.c. generators.

Power application: LeTourneau electric motors driving through LeTourneau gear reductions raise and lower the platform on the spuds.

Controls: Electric switches control raising and lowering of the platform.

Accessory equipment: Two LeTourneau 250-ft.-ton electric revolving cranes, three LeTourneau electric winches—50,000-lb. line pull.

Design Characteristics

Spuds are of open design, truss braced for stress loads but affording minimum resistance to wave action.

Hull is compartmentalized for storage and work areas.

Three spuds are located for stable and level support regardless of ocean floor level variations.

Platform can be located under most conditions, including bearing capacity of bottom, current and tidal ranges.

Platform can be towed in moderate seas.

A well slot is provided for moving off a completed well.

Storage facilities are provided for pipe, mud and drilling water.

Blocks

Oilwell No. 500 crown block 6 50-in. diameter sheaves for 1⅜-in. line rated 500 tons (special Lee C. Moore fast line sheave in derrick provides additional capacity).

Oilwell No. 480 traveling block 6 50-in. diameter sheaves for 1⅜-in. line rated 480 tons.

Swivel

Oilwell No. S6-400 rated 400 tons.

Rotary

Oilwell No. 26-HD rated 350 tons.

Hook

Web Wilson No. 450 rated 450 tons.

Derrick

Lee C. Moore 140 by 30-ft. base, 100 m.p.h. actual wind load capacity, 1,100,000-lb. capacity Lee C. Moore 1,400,000-lb. capacity substructure.

Electric-Generating Equipment

Two Waukesha 6 NKDBS diesel engines direct connected to two electric machinery 200 k.w. a.c. 440/220 volt, 1,200 r.p.m. electric machinery generators.

TABLE 2—MAJOR DRILLING EQUIPMENT, THE SCORPION

Draw Works

Oilwell No. 96: 1,500 input horsepower, 6 hoisting speeds, 3 rotary speeds, 2 reverse speeds, 30 by 47-in. drum with LeBus grooving, 54 by 11-in. self-energizing brakes, 60-in. Parkersburg hydromatic brake, 45-in. dual Fawick high and lo drum clutches. All draw works clutches air controlled remotely.

Drive

Oilwell No. 1500-4 engine: 28-in. dual Fawick master clutch, 32-in. Fawick master compounding clutch (provides two easily separated units of two engines each), 32-in. Fawick pump clutches, 1½-in. pitch quad compound chain, 1½-in. pitch sextuple pump driving chain.

Engines

Four General Motors Model 122403 6-110 twin diesel torque converter units rated 400 hp. continuous torque converter, General Motors Allison Model 850 pumping type, 28-in. Fawick clutches to drive.

Pumps

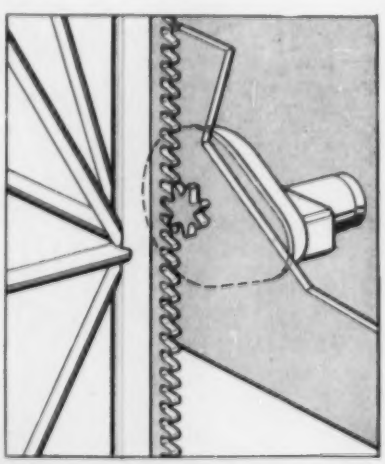
Two Oilwell No. 818-P: Rated 925 input horsepower at 65 r.p.m., bore and stroke 8 by 18-in., displacement 930 g.p.m. at 65 r.p.m.

Catworks

Oilwell No. 52-T draw works (specially adapted for catworks, coring, and rotating operations): 350 input horsepower, drum for coring line operation. Powered by General Motors Model 122403 6-110 twin-diesel torque-converter unit (identical to main engines).

Drilling Control

Oilwell Model No. 15: Driven through hydromatic brake shaft to drumshaft.



PINION RACK for elevating the platform. Fig. 3.

Pumps and drilling control . . . Mud circulation is by two power pumps rated at 925 hp. input at 65 s.p.m. Each is driven through heavy-duty roller chain operating in oiltight guards. Some of the things affecting pump choice were narrow over-all width, low weight per horsepower, and pressure and volume capacity.

In spite of the automatic drilling control being located in the machinery room next to the draw works, the driller can still control it from his position above. The automatic driller regulates weight on the bit closely, and it should also help raise penetration rate and assist in the directional drilling common to offshore wells.

The Scorpion's derrick is a 140-ft.-by-30-ft. base, 1,100,000-lb. derrick with a 9-ft., 6-in. substructure. Because of the location of the fast line, the derrick has one special crown sheave to guide the drilling line onto a standard six-sheave center-pin crown block.

To make it easier to move the platform off a completed well, the derrick and substructure are arranged to jack back off the well position.

Sand reel and cat works . . . Mounted on an outrigger support off the derrick substructure, the platform has a combination cat works and sand-reel unit. This draw works has been modified to spool 16,000 ft. of 9/16-in. sand line, besides powering the rotary table and mounting the catheads.

When the sand line is being spooled, an operator must be at the cat-works control panel. However, all other drilling operations involving the unit are controlled from the main-derrick-floor console.

Besides all necessary indicating instruments, this main console contains the main-engine throttles, engine and pump clutch controls, the compounding and master clutch controls, the feed-control clutch lever and the main brake handle. It also has the usual draw-works hoisting controls. In a separate bank on this console are the cat-works controls that involve the operation of the rotary table and catheads. Some of the driller's controls are duplicated in the main machinery room below deck to insure good safety practice and flexibility of operation.

With the exception of the shale shaker on the main deck, all mud equipment is in the port-side tube. Sand traps, settling tank, and the active and reserve pits (shown in Fig. 2), are connected by a steel walkway over them.

A list of drilling equipment used in construction of the barge is given in Table 2.

by W. L. Nelson
Technical Editor

Properties of Canadian Oils

What are the properties of Canadian and Venezuelan oils with respect to sulfur, percentages of cuts, etc., especially the stream available in the Lakehead line of Canada?—M.P.S.

The situation in Canada changes so rapidly that the addition of a new field or a new line could greatly alter the properties of the oil that is available. At present Redwater and Leduc-Woodbend fields are the largest producers and accordingly, the Lakehead line probably handles oil in the gravity range of 35°-37° A.P.I. Table 1 indicates various fields during 1953. The average gravity of Canadian oils is about 35.2° A.P.I. and the distribution of gravity may be compared with that of other oils in Table 2.

The distillation curves and product distribution of the Canadian oils is normal in every respect.

Sulfur . . . Canadian oils contain slightly more sulfur than Venezuelan or U.S.A. oils of the same gravity:

APPROXIMATE RELATIVE SULFUR
(U.S.A. and Venezuela = 1.0)

Middle East	3.0
West Texas	1.75
CANADA	1.3
California	0.75
Gulf Coastal	0.15

Apparently, most or all of the oils are "sour." They compare with other oils as follows:

APPROXIMATE CUBIC FEET OF H_2S PER 100 GAL.

Kirkuk	over 10.00
Wasson and Howard Glasscock, West Texas	2.85
Ras Tanura	1.38
CANADA:*	
Redwater	1.52
Turner Valley	1.42
Leduc	0.139
Golden Spike	0.096
Kansas	0.89
Slaughter, West Texas	0.18
Kuwait (stabilized)	0.16
Temblador, Vene.	zero—0.147
Venezuela	zero—0.038

*Anon., "Refining Crude in Western Canada," The Oil and Gas Journal, Nov. 3, 1949, p. 77.

Quality of products . . . Although the straightrun gasoline cannot be classified as good, they are better than West Texas and Middle East gasolines as indicated in Tables 3 and 4, and they are the equal of most U.S.A. gasolines. The relatively poor susceptibility to TEL is the main reason for low quality of the gasolines.

TABLE 3—OCTANE NUMBERS OF CLEAR 400° F. CANADIAN GASOLINES

°A.P.I. of crude	Average Venezuelan	CANADA	West Texas	Middle East
12	62			
16	64			
20	60			
24	56		58	
28	53	56	45	
32	56	54	54	39.5
36	59	52.7	49.5	40
40	60	51.5	37	39.5
44	62	50.8		
48	61			
52	63			

The kerosines from the higher-gravity crude oils (37°+ A.P.I.) are good but kerosine from the other oils tends to contain too much sulfur. The diesel fuels (400°-700° F.) from crude oils in the gravity range of 30°-38° A.P.I. are good but it is necessary to lower the end point of the diesel fuel if it is produced from high-gravity crude oils. Reduction in end point lowers the pour point.

Lubricating oils can, of course, be produced from Canadian crudes.

TABLE 2—GRAVITY DISTRIBUTION OF CANADIAN OILS (PER CENT)

Below these gravities:	Venezuela	U.S.A.	CANADA	Saudi Arabia	West Texas
10	1.0				
15	9.1	1.0	3.4		
20	41.3	4.0	5.7		
25	47.7	11.3	5.7		
30	65.8	23.4	6.5	1.5	10.5
35	85.7	*52.0	41.1	32.5	*38.0
40	97.1	*83.0	*98.0	99.8	*65.0
45		*96.0			*81.0
Average A.P.I.	25.3	34.7	35.2	35.8	

*Estimate.

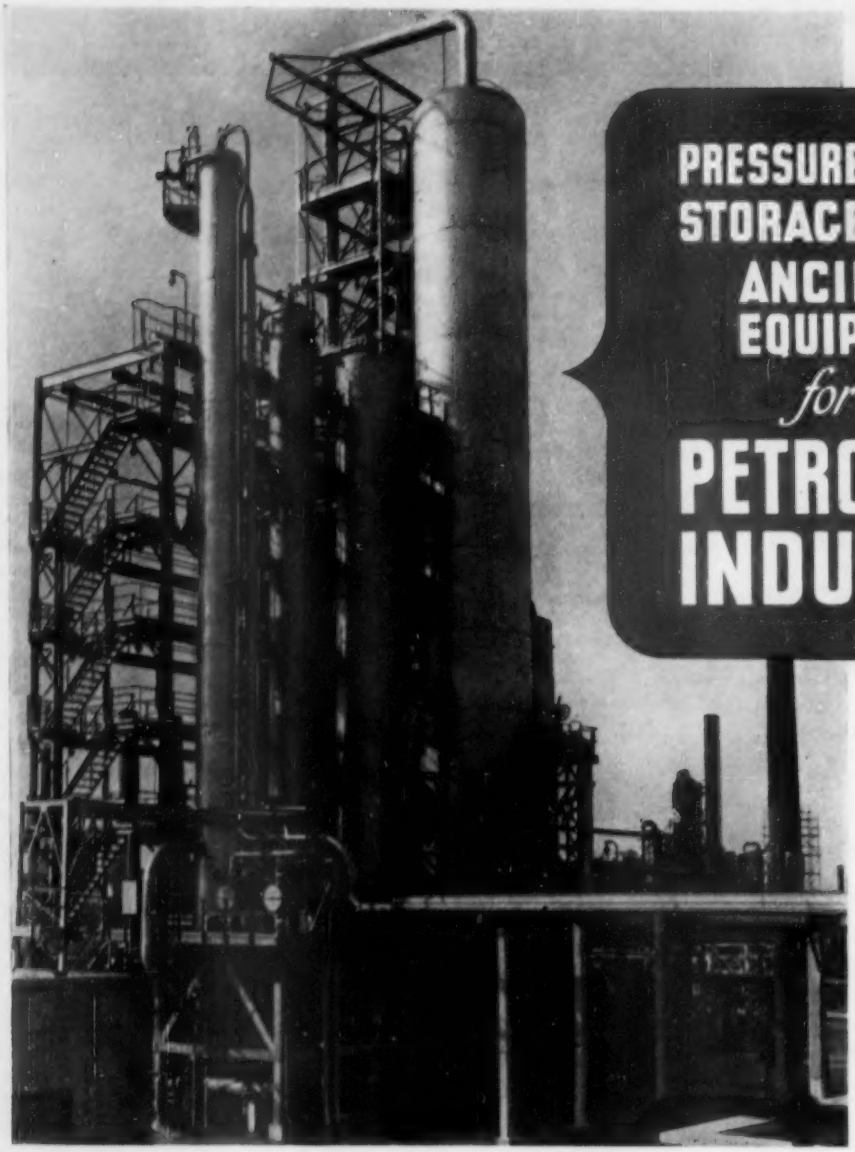
TABLE 1—THE PRINCIPAL OIL POOLS OF CANADA

Year disc.	Field—	°A.P.I.	Production, 1953—Daily	Cum., M bbl.	Reserves, MM bbl.	Posted price, Jan. 1956, $ per 35 Imp. gal. bbl.
1948	Redwater, Alberta	33-36	55,602	72,738	700	2.49
	Sturgeon Lake and Pembina, Alta.				500+	2.52
1947	Leduc-Woodbend, Alta.	35-42	52,124	66,276	290	2.60
1952	Bonnie Glen-Pigeon Lake, Alta.	35-43	7,911	2,168	250	
1949	Golden Spike, Alta.	38	3,746	2,973	162	2.51
1951	Wizard Lake, Alta.	38	5,895	2,949	102	
1951	Armena-Camrose, Alta.	36-38	9,133	3,015	80	
1939	Lloydminster, Alta.	9-17	3,966	5,087	75	
1939	Lloydminster, Sask. & Mani.	17	3,847	2,022		
1951	Coleville, Sask.	13-16	1,802	600	70	
1950	Atcheson-Stony Plain, Alta.	37-18	6,122	4,089	62	2.54
1949	Joseph Lake, Alta.	37	3,291	2,523	24	
1949	Stettler, Alta.	27-30	1,389	1,725	23	
1913	Turner Valley, Alta.	37-41	6,903	111,872	20	
1949	Excelsior, Alta.	35-36	2,288	1,894	20	2.46
1952	Malmo, Alta.	34-40	1,765	589	15	*2.46 & 2.56
1950	Duhamel, Alta.	34-35	1,262	759	12	2.49
1949	Campbell, Alta.	30-33	92	187	11	
1951	Daly-Virden, Mani.	33		323	10	2.34
1951	New Norway, Alta.	32-39	776	449	6	2.29 & 2.56
1950	Big Valley, Alta.	30-34	2,008	1,186	6	2.13
	Others		12,521	44,245		
	Total		182,443	327,669	2,500	

*Low cold test.

TABLE 4—OCTANE NUMBERS WITH 3 CC. TEL OF 400° F. CANADIAN GASOLINES

°A.P.I. of crude	Average Venezuelan	CANADA	West Texas	Middle East
12	79			
16	81			
20	79			
24	78		72	
28	75	72.2	62	62.5
32	78	71	68.5	62.7
36	79	70	65	62
40	80	69.4	56	61.9
44	81	69.1		
48	80			
52	82			



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JOB IMPROVEMENT FOR THE PROCESS FOREMAN—50

The A, B, C's of Instrumentation—3

DIFFERENTIAL pressure gages and manometers are built in a variety of styles to suit the job at hand. The ordinary glass U-tube may be used on simple, low-pressure jobs. One of the metal manometers would be required on a high-pressure job or one requiring recording or controlling. The plain-tube mercury manometer (Fig. 18) is in general use to measure orifice-plate differentials and some low static pressures.

When used on flow measurement, a "square root" type of chart or scale is used to relieve the operator of the necessity of extracting the square root each time a reading is made. This type of manometer is generally preferred over the formed-tube (Fig. 19) or formed-bell (Fig. 20) types as they are easier to keep in calibration and easier to detect when out of calibration. These formed types have one good feature in that the square root is extracted by the shape of the tube which results in a chart or scale with even graduations.

Plain bell-type manometers are sometimes used on gas services when very low differentials are involved. Bellows-type (Fig. 21) and slack diaphragm-type (Fig. 22) instruments that do not use mercury or any other liquid are being used to advantage on some jobs.

New methods of temperature measurements . . . One of the latest methods of measuring differential pressure is one which promises to overcome many of the problems encountered in the older methods. It is the force balance method (Fig. 23) being offered by several companies.

As the name implies, any slight movement of the measuring diaphragm or bellows causes an air pilot to supply an output pressure to oppose and balance the force resulting from the measurement. The output air pressure is calibrated to a standard range of 3 lb. equals zero and 15 lb. equals 100 per cent of the instrument range or measurement. It may be used to transmit, indicate, record, or control with that manufactur's or any other manufacturer's equivalent line of equipment. A D/P cell is one example of the common types of differential-pressure measuring devices.

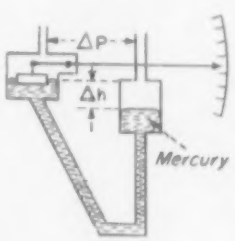


Fig. 18

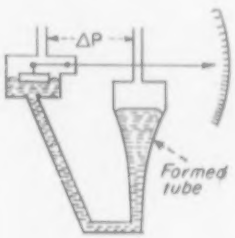


Fig. 19

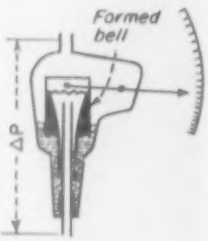


Fig. 20

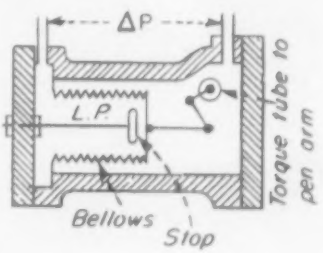


Fig. 21

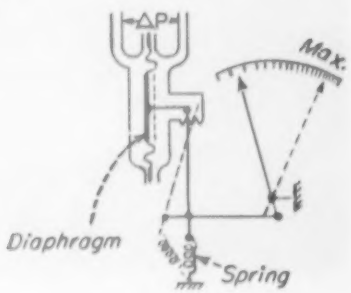


Fig. 22

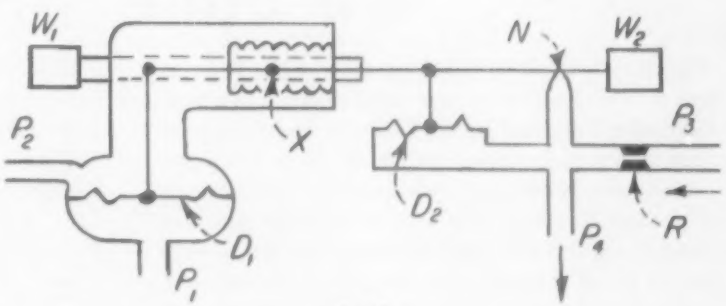
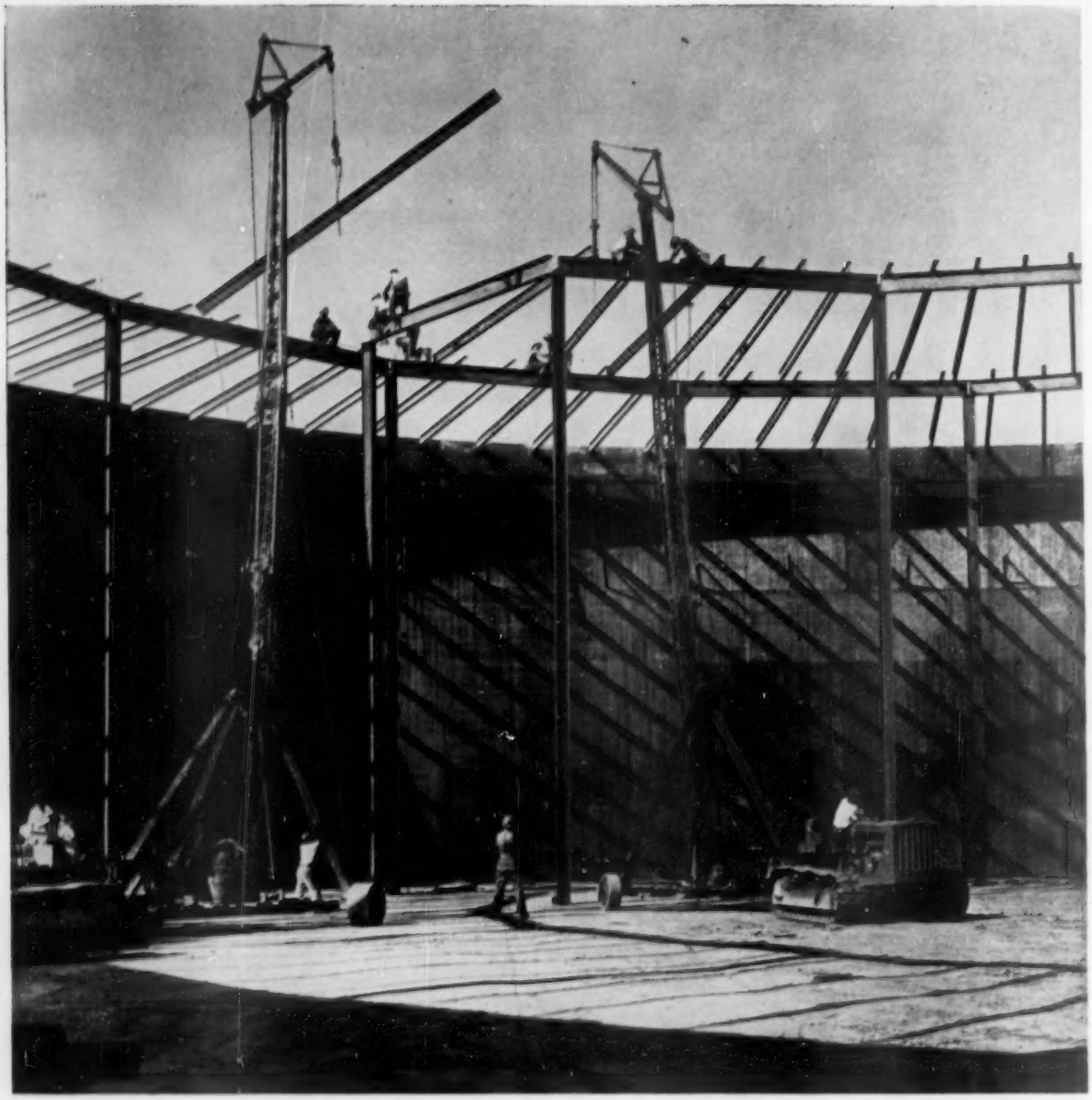


Fig. 23

This material is taken from "Fundamentals of Refining," operating manual of Magnolia Petroleum Co., refining division, Beaumont, Tex.



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BETHLEHEM STEEL

by W. L. Nelson
Technical Editor

COST-imating

10. Refinery Depreciation Rates

DEPRECIATION rates no longer occupy a dignified position because they must always bow to the federal tax departments. Accordingly they must be defined as "A retirement factor allowed by the Bureau of Internal Revenue for a comparable plant, or assembled from published tables for individual equipment."[6] Thus, estimators and financiers must look to more realistic rates of amortization or replacement[4] which consider obsolescence and inflation as well as the bookkeeping entry known as depreciation.

Actually, the rate at which equipment becomes useless is vitally dependent upon how well it is maintained, and accordingly the estimator must consider depreciation, inflation, maintenance, and obsolescence as a whole.

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6. Beattie and Vivian, Chem. Engineering, Jan. 1953, p. 172.

REFINERY EQUIPMENT, YEARS USEFUL LIFE

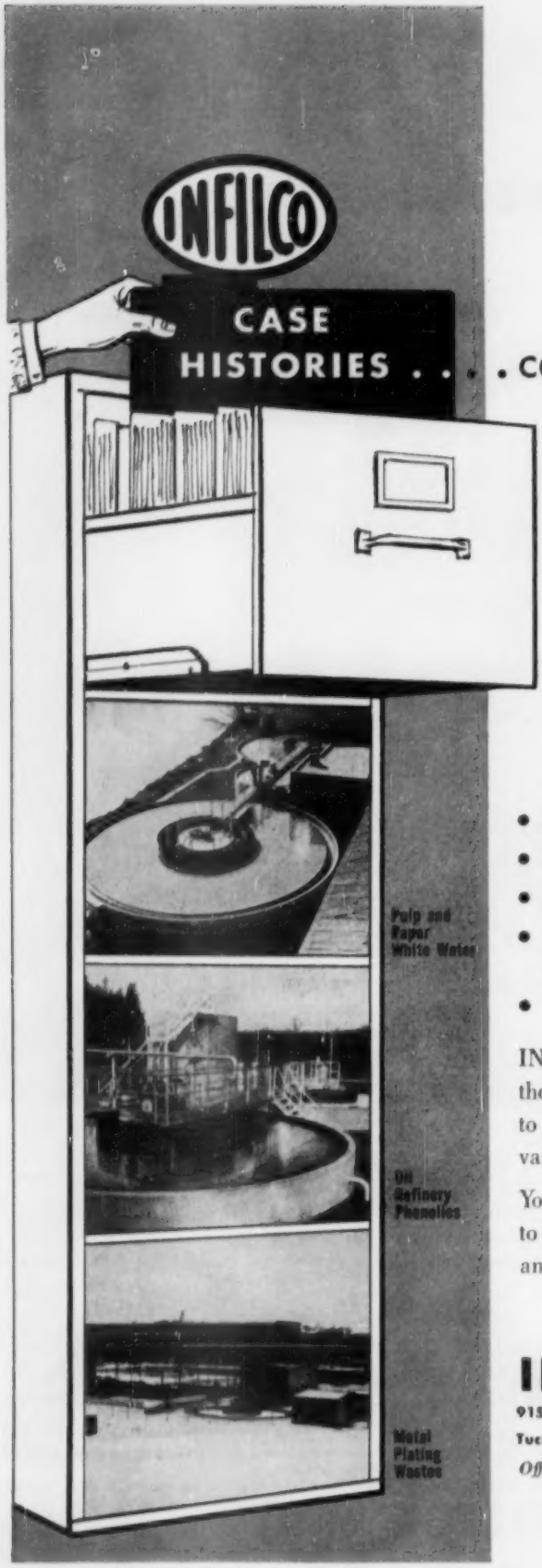
	Bull. F[1]	Common[2,3,5]
Acid manufacture or recovery		20
Agitators or treating vessels	25	7-16½
Asphalt lines and pumps		20
Buildings and structures		12-33
Buildings, brick pump, receiving houses		12-50
Buildings, frame		10-20
Boilers	14-25	6-10
Carbon black plants	20	12.5
Chemical plants, alky., isom., or poly.		5-25
Compounding equipment		20
Condenser, boxes	25	10-20
Condenser, coils	25	4-10
Condenser, tubular	20-25	3-10
Cracking stills, complete	15	4-13½
Cracking stills, piping		2.5-4
Cracking stills, condensers		3-8
Catalytic cracking plants		5-15
Compressors		6-20
Debutanization and stabilization		20
Distillation stills, fire	15	
Distillation stills, steam	20	7-18
Distillation stills, vacuum	20	7-18
Distillation stills, pipe or tube	15	7-15
Electric plant		20-36
Electrical transformers		25
Presses, oil or wax		25-30
Exchangers	20	4-16
Filtering plants and equipment	25	20-30
Gasoline plants, natural gasoline	15	12.5-20
Laboratory equipment		3-15
Lube oil equipment		10
Loading racks		10-25
Office furniture and equipment		7½-20
Pumps and compressors	20	4-20
Piping, interunit lines, small	25	4-20
Pipelines, short		10-15
Steam mains		25
Sewage and traps	25	20-30
Trucks and automobiles		2½-8
Tanks, field		10
Tanks, compounding	30	
Tanks, stock or rundown		10-25
Tanks, storage	30	10-33
Tanks, treating	20	7-16
Tools, hand		2.5-7
Tools, shop or machine		7-12
Towers	20	7-16
Treating equipment		15-17
Wax plants	25	18-20
Refinery—complete	25	12-22

REFINERY AUXILIARIES—APPROXIMATE* USEFUL LIFE IN YEARS[1]

Air conditioning, or refrigeration, small	10-11
Barrels	7
Buildings, construction	None
Buildings, garage, shops or dwellings	33-50
Buildings, office	20-67
Buildings, warehouses	40-67
Barges and tugs	4-6
Boilers	14-25
Boilers, waste heat	30
Caustic tanks	18-25
Compressors, small	10
Compressors, large	20-25
Construction equipment:	
Buildings	10
Road	6
Construction machinery:†	
Blacksmith, portable	4
Boilers, portable	15-20
Bulldozers	4-8
Compressors	5-10
Concrete mixers	3-8
Cranes, excavators, hoists	4-20
Jacks	3-8
Gin poles	10
Hose or steam shovels	5-10
Tractors	3-10
Road oilers	8-10
Wheelbarrows	2
Winches	10
Dams, earthen	90
Electrical, wiring	20-25
Electrical, distribution	22-40
Electrical, machinery	17-20
Engines, gas or oil	6-15
Engines, steam	8-20
Fences, woven wire	15-25
Fences, wood and wire	8-15
Fire protection, equipment	10-20
Fire extinguishers	3
Fire banks and walls	30
Gas, utilities, distribution:	
Mains	80
4-in. and smaller	30-50
Miscellaneous	33-40
Ice plants	22
Insulation, cold	20
Insulation, hot	15
Lighting, building	15-20
Office, fixtures and files	20
Office, equipment, mechanical	8-10
Packaging and package manufacture	20
Pavements, concrete	20
Pavements, asphalt or macadam	15-20
Plumbing, building	15-25
Power, steam:	
Boiler plant	28
Structures and improvements	50
Shop machinery:	
Auto repair	10
Blacksmith	20
Machine	20-25
Woodworking	25
Stacks, brick	14-50
Stacks, steel	10-44
Sulfuric acid:	
Pumps and blowers	5-10
Tanks	17-20
Tank cars	12
Tank cars	20-30
Tankers	20
Telephone equipment	10-33
Vehicles:	
Automobile	3-4
Tractors and trailers	3-12
Trucks, light	4
Trucks, heavy	8-10
Wharves and piers	20-30

*Taken mainly from Bulletin F[1], but not listed directly under the heading of refining.

†Construction equipment kept in a plant may last longer than shown here.



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5541

by Otha H. Grimes

FIELD PROCESSING
NATURAL GASOLINE REFINING

How Today's Portable Gasoline Plants Operate—1

PORTABLE gasoline plants involve an additional cost for the skid unit or units on which the equipment is mounted. This cost is offset by simpler foundation construction and generally less foundation concrete requirements. There are other cost factors in field-constructed plants which, when included with the foundation item, substantially exceed the skid cost.

Portable plants also require substantially less know-how on the part of the field erection personnel. They are frequently sold to, and erected by, production people who are not particularly skilled in gasoline-plant construction and who especiallly welcome the erection simplicity.

For example, the intricate process piping is complete when the plant units are received in the field. The remainder of the process piping is prefabricated and stenciled, and this eliminates the possibility of field mistakes and confusion. The piping work done in the shop is performed by a crew perfectly familiar with the work, and therefore is done more efficiently and more economically than would be the case in the field. As may be observed, the cost of this equipment can be predetermined. Also, the salvage value of such plants is high.

Units simple . . . These units have been designed for maximum simplicity consistent with efficient operation. Many of these units have been applied to: (1) comparatively high-pressure gas processed at up to 1,000 psi. and higher, and (2) where the residue gas is delivered to a gas-transmission system and the processing pressure therefore depends upon pipeline pressure.

The Stroud, Okla., plant described here (Fig. 1) involves a more or less conventional absorption - distillation cycle with several special features that contribute to the goal of maximum simplicity. The fundamental ideas involved herein can be, and have been, applied to various processes—such as absorption combined with very-low-pressure dry distillation, and processes not using absorption oil at all but using gas fractionation and refrigeration.

Author is in the natural-gasoline business in Tulsa. Paper presented at annual N.G.A.A. meeting, Fort Worth, April 13.

This Stroud plant, however, is more conventional. It involves a main absorber operating at 300 psi. pressure, a reabsorber operating just below still pressure, the still operating at a pressure between 100 and 125 psi., and product fractionators consisting of the usual deethanizer, depropanizer, and debutanizer. These are for the production of three streams—natural gasoline, a butane-propane mixture, and propane.

In this particular plant, all of the pressure vessels are mounted on a single skid. The complete skid unit also includes process pumps, fractionator reboilers, control equipment, scrubbers, reflux separators, etc. Heat-exchange equipment, except for reboilers, is separately skid-mounted. The oil-heating furnace is set up at a safe distance outside the hazardous area. In this particular plant, a combination of air cooling and water cooling is used, air cooling being applied to the high-temperature-level duties and to engine-jacket-water cooling.

Simple plants . . . Several of these plants have been built with a single fractionator to produce only natural gasoline. With a single fractionator, the plant is exceptionally simple.

Such plants are particularly applicable to those projects where the gasoline production is delivered to a crude-oil pipeline system and mixed with the crude and where an attendant is not made necessary for truck loadings.

One of the important items simplifying the operation of these plants is the heating arrangement (Fig. 1). The heat required for the entire plant is furnished by a single oil furnace. This furnace preheats the rich-oil stream entering the still. The rich-oil stream is usually heated to about 500° F. The lean-oil stream leaving the base of the still is used to supply other process heat requirements.

First, a controlled portion of this stream passes through pipe coils in the bottom of an evaporator unit mounted on the skid. This is used to evaporate water, providing process steam for the still. This is the only steam used in the plant. There are no boilers. Second, the hot lean-oil stream passes to fractionator reboilers, preheater, and power gas heater and then back to the absorption-oil exchangers.

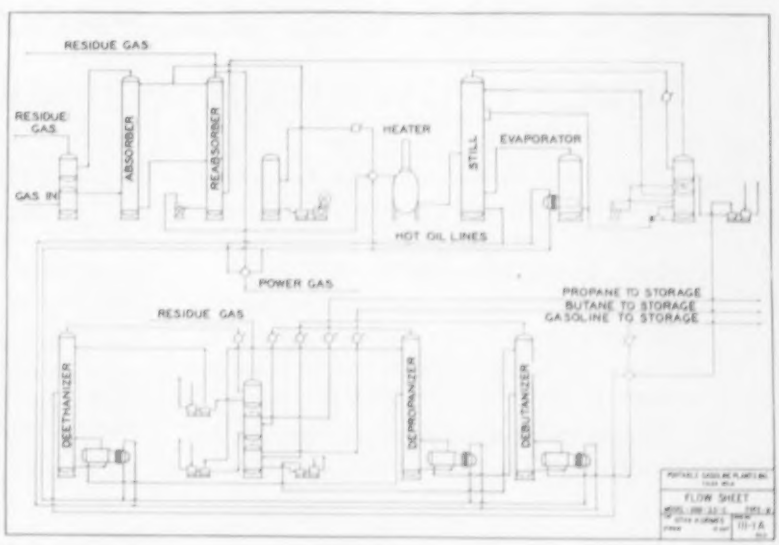

Fig. 1.

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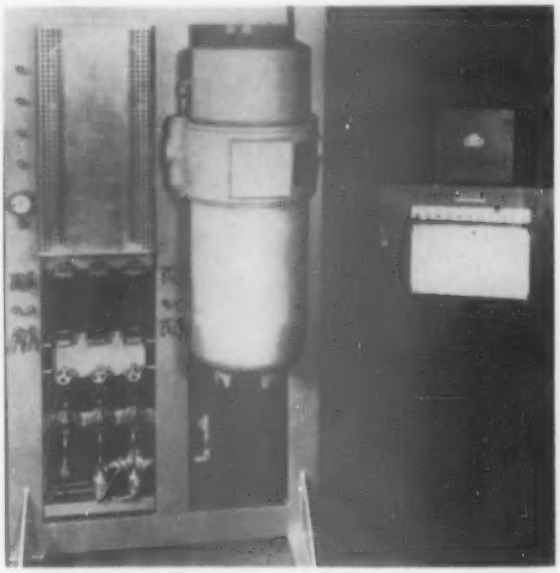
Here's a new way of . . .

Measuring water vapor in gas pipelines

This new instrument will continuously detect and record small concentrations of water vapor in air or natural gas, with an accuracy of 1 p.p.m.



THERMOELECTRIC instrument and recorder for continuous monitoring of low concentrations of water vapor in gas streams. Fig. 1.

A NEW method and instrument for a continuous automatic recording of low concentrations of water vapor in gas streams has recently been developed for pipeline use.

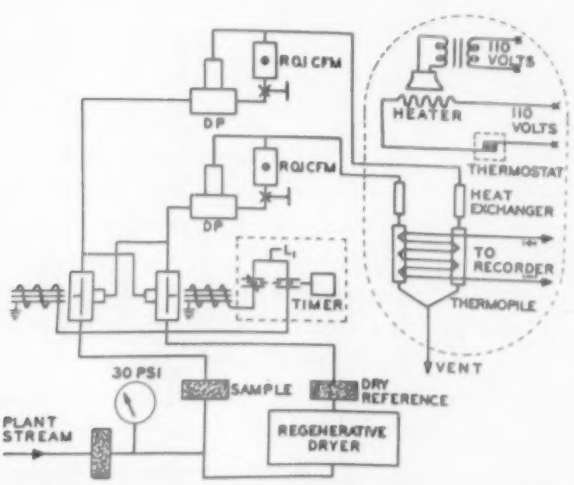
The new method, operating on 4-minute measuring cycles, has been used in instruments with a full-scale range of 100-p.p.m.-water by volume. And it now appears possible to operate satisfactorily with even lower full-scale ranges. Instruments can be made which will record higher ranges. A sensitivity of 0.25 p.p.m. by volume has been attained. Accuracy is limited by noise level and calibration errors to about 1 p.p.m.

The method was developed by the research and engineering departments of Mine Safety Appliances Co., Pittsburgh, and Esso Research & Engineering Co. Its first applications will be in monitoring dryness of natural gas in long pipelines.

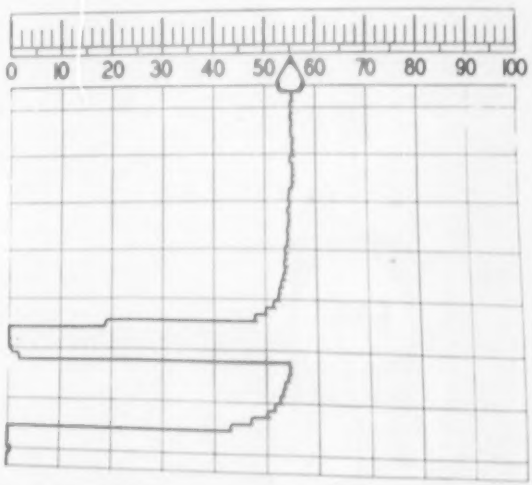
The instrument shown in Fig. 1 will provide a means of monitoring gas so that conditions under which hydrates form can be avoided. Also, the high efficiency of drying towers can be maintained if the water content of the effluent gas is closely monitored so that regeneration is applied before, or at the time of, the first water breakthrough. Similarly, it can be used to prevent moisture damage to certain process catalysts by monitoring the feed streams.

The principle of operation is new. It is based on the heat energy exchanged when a gas is adsorbed on or desorbed from the surface of a solid adsorbent. The method was found to be more adaptable to continuous measurement and recording than existing methods.

How it works . . . A continuous flowing sample of gas is split into two equal streams, one of which is dried com-



FLOW DIAGRAM of instrument. Timer alternately switches wet and dry gas streams to opposite sides of thermopile. Fig. 2.



THIS WATER-VAPOR concentration record was made with the rectified signal received from the detector cell. Fig. 5.

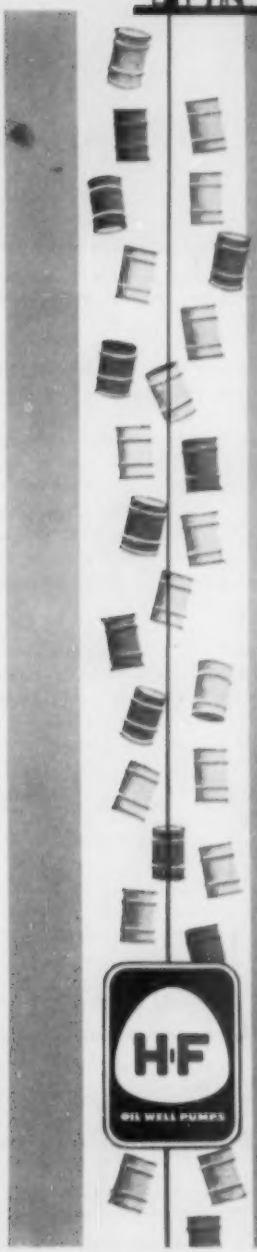
Lift More Oil . . .

HARBISON-FISCHER

Double-Displacement
PAT.

ROD PUMP

More Fluid With the Same Plunger Stroke



This special insert pump has two applications: (1) To lift a greater volume of fluid in order to increase the daily oil production, and (2) To produce the same volume of fluid, but at a slower pumping rate.

The Double-Displacement Rod Pump is a traveling barrel, bottom hold-down assembly with two plungers and two barrel tubes which work simultaneously with a single set of valves. It seats in a standard cup-type seating nipple or the old working barrel made up in the tubing.

Double-Displacement Rod Pumps will handle more volume than tubing pumps of corresponding size, and have the added operating advantages of an insert-type pump which can be run and pulled on the rods.

When a conventional rod pump will no longer produce sufficient fluid to make the oil allowable, instead of installing a tubing pump many operators run a Double-Displacement pump. In addition to the larger capacity over any size tubing pump they could run, their savings on a pulling job usually more than pay out the Double-Displacement pump. Another application is where daily gross fluid rates are limited by short-stroke equipment. Instead of replacing such wells with expensive, larger units, a Double-Displacement Rod Pump can be run in which will handle the required daily fluid volume with the same surface equipment.

Double-Displacement pumps are in successful operation in fields throughout the Mid-Continent area, including many water-flood projects. You are welcomed to obtain illustrated literature and comparative field test data on Double-Displacement Pumps through your store, from one of the field representatives we have in all principal areas, or by writing to us in Fort Worth. There is no obligation, of course.

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Pipeline Patrol

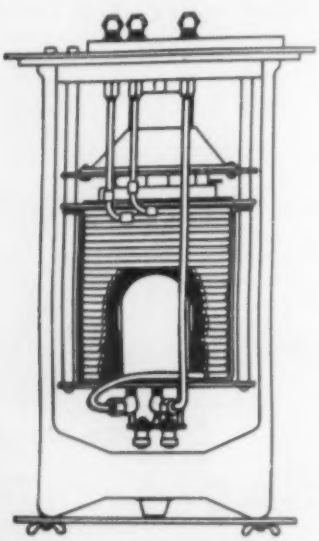
pletely by a regenerative adsorption column. The two streams are then directed alternately through two sides of a detector cell by means of automatically timed and operated three-way valves. During 4-minute cycles, the desiccant in each side of the cell is exposed alternately to each stream for 2 minutes.

A number of thermocouples in the two desiccant beds are connected in a circuit to develop an electrical potential. Since both adsorption and desorption processes proceed simultaneously, the resulting e.m.f. is proportional to the algebraic sum of the gain of heat on one side of the cell and the loss of heat on the other side.

During each half-cycle, the temperature differential in the cell rises rapidly, passes through a maximum, and then diminishes slowly. When the maximum is passed, the flow is switched and the moisture and temperature equilibrium process is repeated. In the second half-cycle, the desiccant and stream (which had lost heat in the previous half-cycle) gain heat and the reverse process takes place in the other side of the cell. The e.m.f. generated is equal but to opposite polarity to that of the previous half cycle.

Considerations in Design

The technique of operation involves a number of factors. This energy, the heat of adsorption, varies with factors such as the nature of the adsorbent, the quantity of moisture adsorbed, and the temperature. In general, it is one to two times the ordinary latent heat of condensation of the adsorbed va-

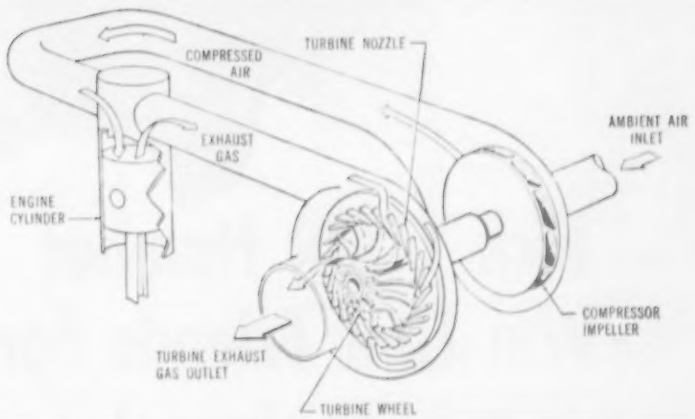


THERMOPILE is in steel flask and kept at constant temperature. Fig. 3.

Caterpillar announces a TURBOCHARGED

D397 (SERIES D) 650 HP Maximum @ 1300 RPM AND D375 (SERIES D) 430 HP Maximum @ 1300 RPM

Compact, modern heavy-duty oilfield diesels for greater power, efficiency and economy!



The Cat D397 Turbocharged Engine

Both the D397 and the D375 are also available as *roots blown, naturally aspirated or spark ignited* engines.

The Turbocharger . . . Exhaust Gas and Air Flow

Another example of Caterpillar leadership in action! The Turbocharger, driven by the engine exhaust, utilizes energy which would otherwise be lost. It packs air into the engine according to engine load for greater efficiency.

As shown in the diagram above, engine exhaust gases turn the turbine, which drives the compressor . . . the compressed air then enters the cylinders. Final result: more power on less fuel.

More than eighteen years of research have gone into these two new CAT* Turbocharged Diesels. Incorporating metallurgical, mechanical and aerodynamic advances, they are engineered to deliver higher horsepowers and lower operating costs at reduced noise levels. Their advance-design features are also available in D397 and D375 Electric Sets and Marine Engines.

With these engines in the Caterpillar line-up, you now have an even wider choice of compact, modern heavy-duty power to meet your requirements. Get the complete facts about these two new Turbocharged Diesels from your Caterpillar Dealer!

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You can help in this vital public information program by joining your local Oil Industry Information Committee—made up of oil men from your community. Right now, 33,299 oil men like yourself are active. Aided by the OIIC District Office, your group can provide films, speakers and demonstrations for civic, social and church needs—in addition to classroom materials for high schools.

Joining in this effort will mean real help for your industry. But *you* will also profit. You'll enjoy the great personal pleasure of working with other members of your community. It will mean winning many new friends for yourself—and for your business as well.

So pick *your* number on the map above—and get in touch with the OIIC District Office in your area today! Why not do it *now* while you have the address handy.

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por. For water vapor and the adsorbent used, the two quantites are about equal.

The two streams of gas must have substantially constant and equal flow. This is done by using flow controllers on the two streams. The flow regulators assure that each side of the detector receives an unchanging flow even though they are not controlling at exactly the same rate. Regenerative drying columns are used but other means such as a chemical drying train or liquid air trap could have been used. The columns can be supplemented with scavenger dryers of phosphorus pentoxide or liquid air traps, but this additional drying has not been necessary in most applications.

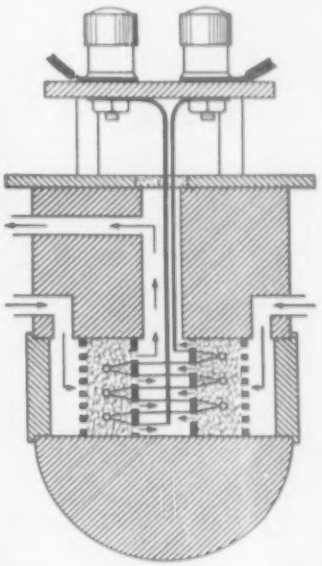
The switching interval must be long enough to permit attainment of a practical equilibrium of the detector desiccants with the gas streams. Equilibrium time may be controlled to some extent by choice of desiccant material, size of desiccant charge, and rate of gas flow. These conditions were adjusted for a 4-minute cycle.

Fig. 2 shows the arrangement of the instrument. The two gas streams flow into the detector cell through a heat exchanger. These are housed in a stainless-steel Dewar flask for insulation, as shown in Fig. 3. The heat exchanger consists of coiled copper tubes surrounding the cell. The proper temperature, a few degrees above the highest ambient temperature anticipated, is maintained by means of an electric heater and thermostat control. Temperature equalization of the streams and the cell is promoted by air circulation within the cell chamber.

Fig. 4 shows the construction of the detector cell and Fig. 1 shows the complete instrument with recorder, including the regenerative dryer for preparing the reference stream. The detector cell and associated temperature-control equipment are contained in the large explosion-resistant housing. The recorder and timer were designed for remote location.

Recording Methods

A relatively high alternating signal is produced for low water-vapor concentrations by using many couples in series in the differential thermopile. Two methods of rectifying the swinging signal, both using a specially designed peak-to-peak voltmeter, were developed. Both simplify interpretation of recorded measurements, which are shown as deflections in one direction from zero, and make possible the use of the signal to operate control equipment. A special voltmeter was required because the frequency of oscillation of the cell signal is only one-quarter cycle per minute.



SECTION of detector, showing desiccant beds, thermocouples, path of gas. Fig. 4.

In one method, the maximum output of the cell during one-half cycle is amplified and stored on a capacitor. During the next half cycle the polarity of the stored e.m.f. is reversed and it is added to the amplified peak e.m.f. generated during that interval. A d.c. potential, proportional to the sum, is then applied to the recording potentiometer. By amplifying the cell output inherent difficulties of storing low potentials in capacitors is avoided.

The signal is gated to correspond to the peak amplitude by means of the same timer as that controlling the switching of the three-way valves. The storage capacity is shorted after each cycle and before receiving a new charge so that decreasing signals can be recorded. The times controls the pen motor of the recorder, allowing it to run for a few seconds following a summation. Then it maintains the pen at this position on the chart until the completion of the next cycle.

The second method was adopted for the instrument. In it the techniques of two-pen recording are used to produce a peak-to-peak voltmeter. But the facilities of one channel, which is normally used to record an independent function, become the storage and integrating section. Gating of signals to the recorder pen is controlled by the timer as described above. A record of water vapor concentration with this method is shown in Fig. 5.

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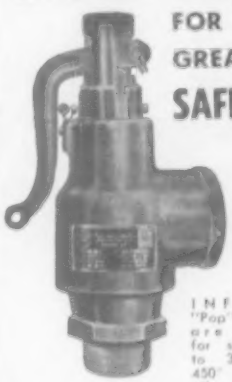

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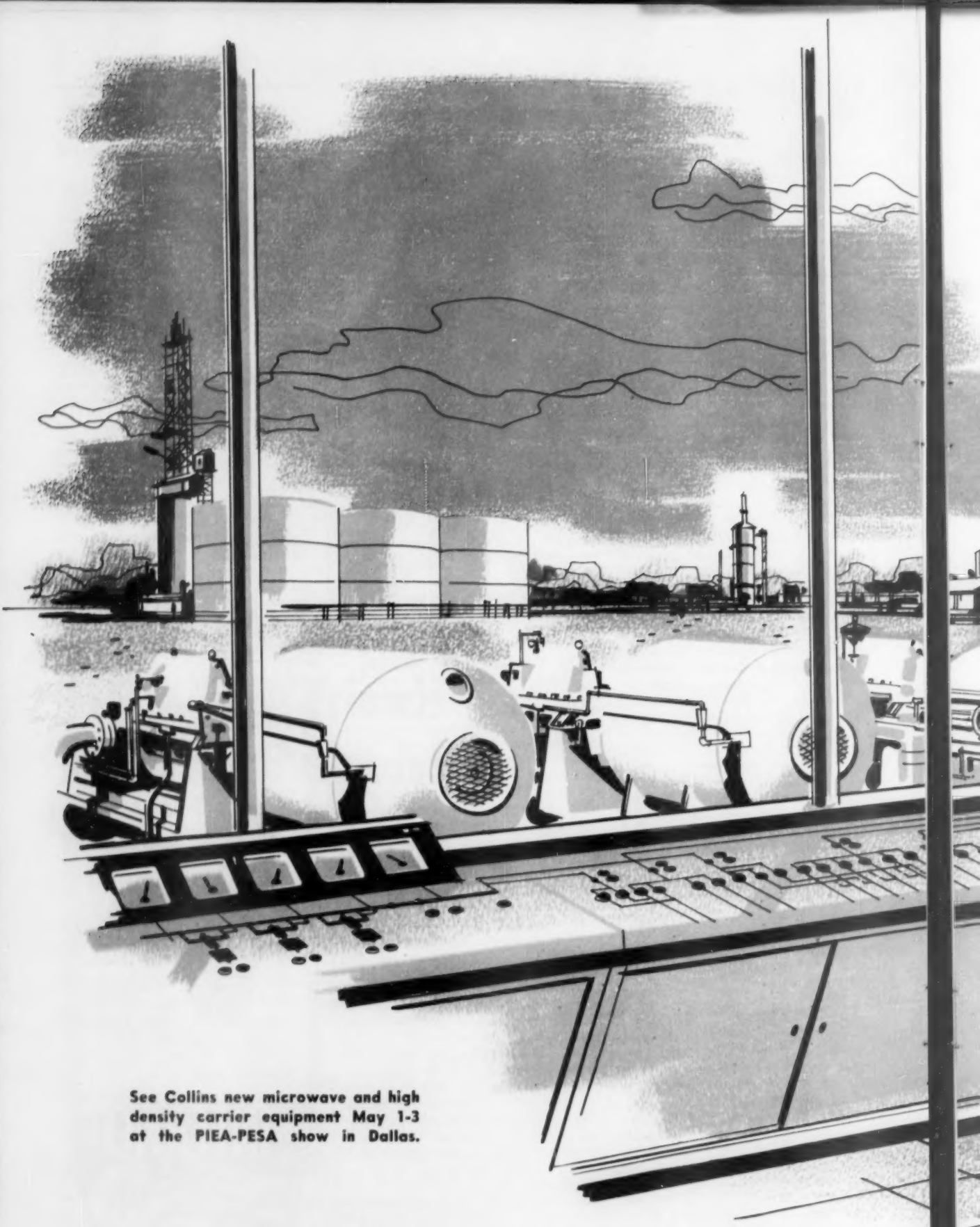
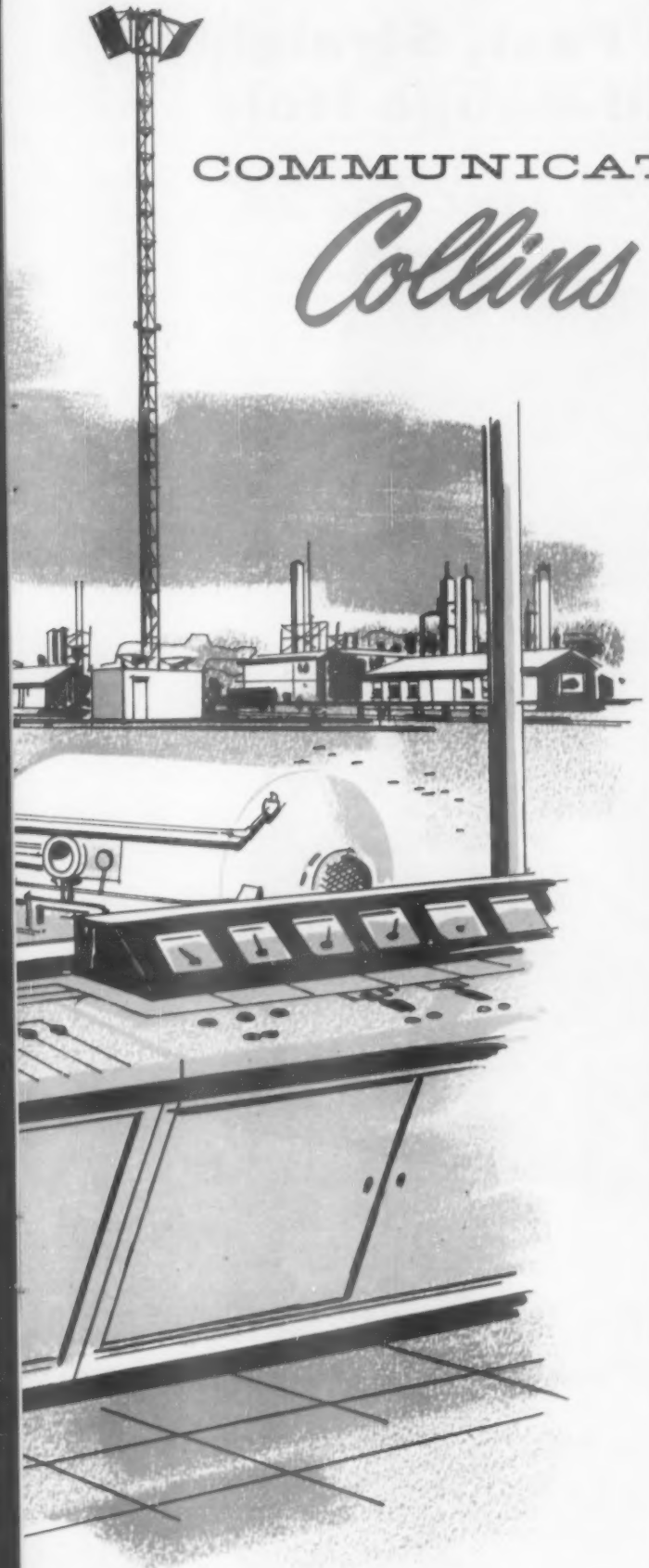


See Collins new microwave and high density carrier equipment May 1-3 at the PIEA-PESA show in Dallas.



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Drilling Group Will Study New Contract Protection

The American Association of Oilwell Drilling Contractors has reactivated its special committee on standard drilling contracts.

The committee, headed by Robert W. Wire, Loffland Brothers Co., Tulsa, contains 12 of its original 17 members. It will review and update the present contract form. It is authorized to insert an escalator clause which would take care of the contractor in the event of unavoidable extra costs during the drilling of a well.

Two other prospective protective clauses will be studied. They will be:

1. Contractor indemnity in cases of improper land titles or lease arrangements made by the land-owner.

2. Mutual agreement with the customer to pay up to 80 per cent of each month's contractural fee during the drilling of the well.

Committee members, in addition to Wire, are:

N. H. Wheless, Wheless Drilling Co., Shreveport; A. W. Thompson, A. W. Thompson, Inc., and George B. Kitchel, Kerr-McGee Oil Industries, Inc., both of Houston; W. S. Frisbie, Frisbie & Yancey Drilling Co., Tulsa; D. Phil Bolin, Bolin Oil Co., Wichita Falls; W. L. McClusky, M. J. Delaney Co., and J. Mark Gardner, Delta Gulf Drilling Co., both of Dallas; Joseph Zeppa, Delta Drilling Co., Tyler; J. S. Morris, Allen & Morris Co., San Antonio; Jack H. Abernathy, Big Chief Drilling Co., Oklahoma City; Howard P. Holmes, contractor, Hobbs, N. Mex.; and M. G. Rowe, Rowan Drilling Co., Inc., Fort Worth.

Brooks Quits El Dorado to Join Sterling Drilling Co.

Sterling Drilling Co., Sterling, Kans., announces the appointment of Frank M. Brooks, formerly associated with El Dorado Refining Co., El Dorado, Kans., as vice president and director, effective May 1. Announcement was made by Rollin Mead, president of the company.

With the El Dorado company, Brooks was director and vice president in charge of exploration and production. He had served that company 10 years, and has had more than 20 years of experience in exploration and production phases of the oil industry. His early experience was gained with Gulf Oil Corp. and Bridgeport Oil Co. in areas extending from Kansas to West Virginia.

Coastal Drilling Co., Los Angeles, is drilling Richfield Oil Co.'s second well in the newly opened oil-productive area southeast of Wheeler Ridge field, in southwestern Kern County, California. The new operation, 63-36 KCLF, is southeast of the discovery well, completed in a 9,000-ft. sand. Coastal is using a larger rig on this well than was on the first hole. It is capable of drilling to 14,000 ft.

Wise Drilling Account, Tyler, Tex., has a new contract operation under way 3 miles north of Maydelle, in Cherokee County, East Texas. Operator is Watburn Oil Co., also of Tyler. The test, 1 Nance, in S. Odom Survey, is scheduled to go to 5,400 ft. for a look at the Woodbine.

Justiss-Mears Drilling Co., Jena, La., has a new contract job in Forrest Home field, northern Adams County, southwestern Mississippi. It is another Wilcox well for John S. Callon, of Natchez, at 4 Armstrong, in 35-8n-1w. Contract is for 5,800 ft.

Falcon Seaboard Drilling Co., Tulsa and Houston, has contracted for two additional deep wells Sunray Mid-Continent Oil Co., Buffalo Oil Co., and Warren Oil Corp. have scheduled for the Ridge-Duson area of western Lafayette Parish, southern Louisiana. The Ridge job, at 1 Hanks, is the third for that new field. It is set up for 14,000 ft. At Duson, several miles north, it will drill 5 McConnell, a 13,500-ft. outpost test.

Circle Drilling Co., Lake Charles, La., is scheduled for a deep wildcat test to be drilled for Fred W. Bates and George C. McGhee in the Trilby area, northern Acadia Parish, South Louisiana. Location, at 1 Frey, in 35-7s-1w, is about 5 miles northeast of Iota. It is 2 miles west of South Bayou Mallet field.

Delaware Drillers, Inc., San Angelo, Tex., has a new 9,000-ft. wildcat operation in Irion County, West Texas. It is a contract job for Murray Petroleum Co. and Sunray Mid-Continent Oil Co. Location, at 1-B Sugg, in Section 5, Block 14, H&TC Survey, is 12 miles west of Mertson.

Warren-Bradshaw Drilling Co., Tulsa, will drill a 7,500-ft. test for

bargain thread dope?

Is cheap thread dope really a bargain? Tool joint and drill collar thread wear can cost a lot over a year's time. Fishing jobs come plenty high. Galling or washouts mean hundreds of dollars of extra expense. 'Bestolife Lead Seal stretches thread life, cuts down on fishing jobs, galling and washouts. That's why it's the most widely used lead base thread compound in the world. Get 'Bestolife at your supply store. In 1¼, 5, 20 and 50 lb. cans. Unconditionally guaranteed.

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30,000 LB. TEST

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Pressure Gauge Needle Valve

FOR YOUR HIGHEST PRESSURE APPLICATIONS

To handle unprecedented high pressures, OCT has developed a pressure gauge needle valve that features a one-piece alloy steel body, a welded bonnet for maximum safety, and a multi-compound, non-crushable V-type packing especially developed to withstand extremely high pressures and temperatures.

This is unquestionably the safest, strongest pressure gauge needle valve ever built.

Please write for full information.

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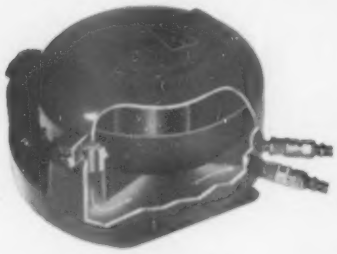
Export Representatives: Sterling Areas—Le Grand, Sutcliff & Gell, Ltd., Rochester, Kent, England. South America—East West Oiltools, C. A., Del Lago Hotel, Maracaibo, Venezuela. Address Export Inquiries for All Other Countries to P. O. Box 3091, Houston, Texas.

NEW! WALKER
Heated Centrifuge



Combination Preheater and Heated Centrifuge!

This new low-cost machine preheats crude oil samples and keeps them warm during the shake-out. The only low-cost field device to make possible accurate B. S. & W. tests regardless of weather. Can be easily installed almost anywhere on gauger's car. Both 6 and 12 volt models. Write today for information and prices.

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Lengths—20, 25, 30 ft.

Composite Catalog Page 3369

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Sunray Mid-Continent Oil Co. at a wildcat location 2 miles west of South Laverne field, in southwestern Harper County, northwestern Oklahoma. It will be carried as 1 Hill, with location in 6-25n-25w.

Oroco Oil Co. has a rig under contract to El Paso Natural Gas Co. in exploration for gas production in the Payette area, of Payette County, in the Vale-Ontario basin, on the western border of Idaho. It now is drilling El Paso's 1 Assmussen, a 3,500-ft. test in 8-9n-3w.

Danforth Drilling Co. has contracted for a wildcat test to be drilled for Bruce Sullivan and Edwin Pauley in the old Garcia gas area, 15 miles southeast of Trinidad, in Las Animas County, southern Colorado. The operation is at the operator's 3 Carolos and others, in 4-34s-62w. The area, near the New Mexico line, is in the Raton basin.

Glenn Drilling Co., Tulsa, is drilling Sunray Mid-Continent Oil Co.'s new Justiss-sand (Cotton Valley) east-outpost test at Cotton Valley, in Webster Parish, northern Louisiana. The test, 1 Lee, in 28-22n-9w, is well along toward its objective around 9,600 ft. Location is about ¾ mile from nearest Justiss-sand production.

Mercury Drilling Corp., Shreveport, has joined George Belchic, Jr., in two southwestern Arkansas wildcat drilling ventures. One is in Lafayette County, and the other in Miller County. The first will be at 1 Patton, in 6-16s-24w, about 2 miles northwest of West Lewisville field. The other will be at 1 Williams, in 23-16s-26w, ¾ mile south of McKinney Bayou field, and about 2 miles northeast of Fouke field. Both tests are projected to the Lower Cretaceous at depths of 4,000 to 4,200 ft. Mercury will do the drilling.

Woolf & Magee, Tyler, Tex., are on a new contract job in eastern Concordia Parish, eastern Louisiana. It is a 7,000-ft. Wilcox test at a wildcat location in 59-5n-9e, 1½ miles southwest of Deer Park and 2½ miles southwest of Deer Park field. T. J. Glennon is the operator. The test will be his 3 Mac Rae and others.

Green & Heiser Drilling Co., Bakersfield, Calif., has contracted for a wildcat test to be drilled for Malco Asphalt & Refining Co., of Roswell, N. M., in the Helm area of Fresno County, Central California. It will be an 8,500 to 9,000-ft. test through the Miocene and Eocene sands productive in Helm field. Location, in 15-16-16, is northwest of production.

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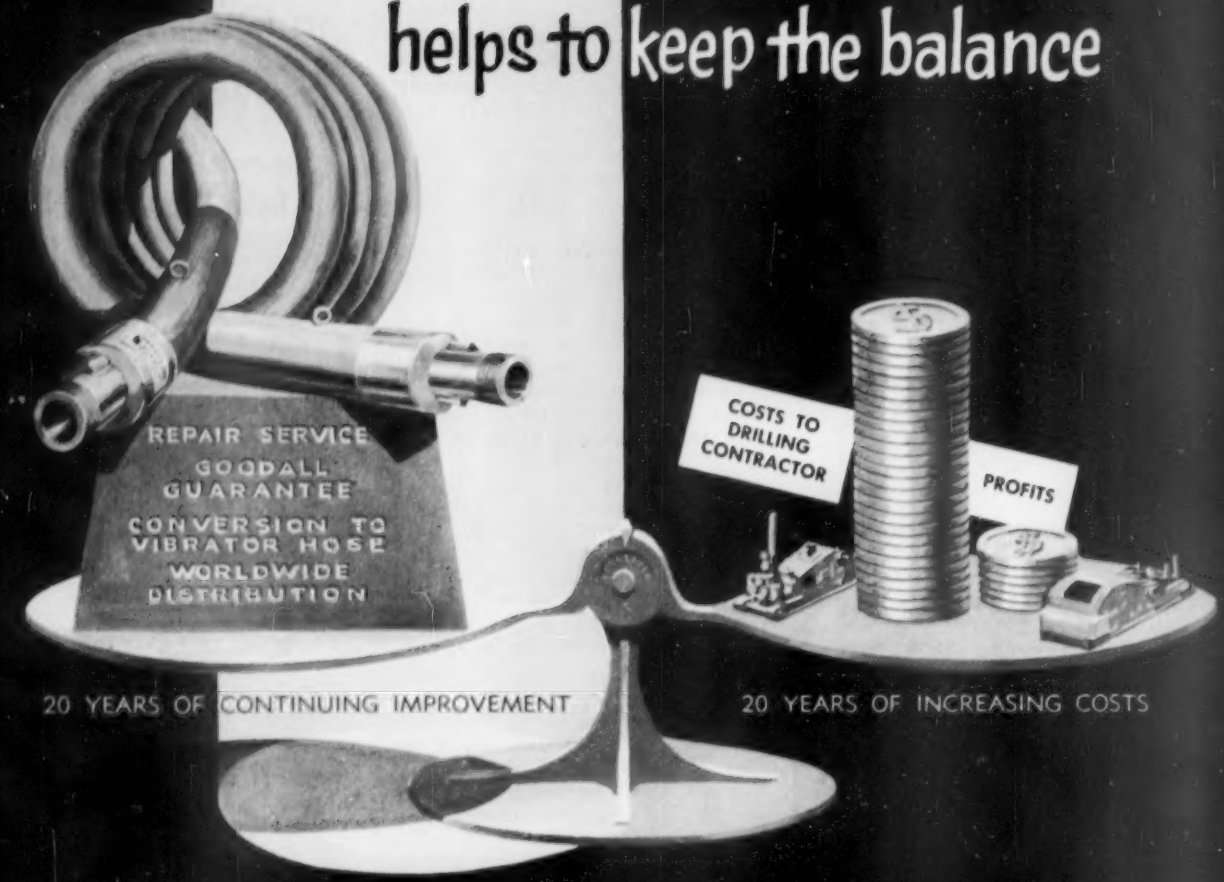
helps to keep the balance



Over the last twenty years drilling costs have increased tremendously. The tight competition has made drilling contractors increasingly cost conscious. Through these twenty years, Goodall has developed many features that add life to the Goodall rotary hose and help to balance the increasing costs, by giving added value. These exclusive Goodall features mean longer hose life—and that means dollars saved to the drilling contractor.

Goodall rotary hose features include—The Barney Coupling—The Goodall Repair Service (converts damaged Goodall rotary hose into vibrator hose)—The Goodall Guarantee—world wide distribution.

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Showcase

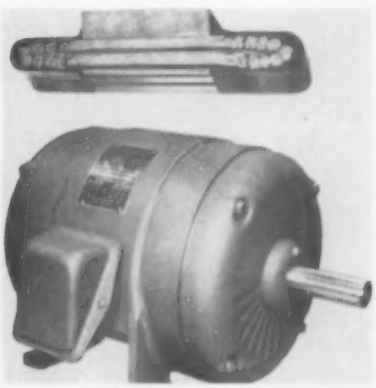
OF NEW EQUIPMENT AND LITERATURE

by Dan B. Miller

Plastic Insulation Is Molded Into New Motor

A new line of motors is available in standard sizes from 1 to 40 hp. The line is built in the open-type frame and torque design B and complies with NEMA specifications.

Thermosetting plastic insulation is molded into and around the stator windings. The motor stator is placed into a die, and the plastic material is forced into the die under the proper heat and pressure. The liquid plastic resin is extruded through the stator slots, completely covering the stator winding.



The plastic has demonstrated resistance to chemical action, humidity, abrasive dust, lint, and oil vapor. In addition to chemical protection, the insulation provides thermal protection. The plastic provides a medium for conducting the heat uniformly away from every wire.

The new plastic also provides a high degree of physical protection. Windings of motors subjected to severe vibration often become loose, break or rub, thereby scraping off the insulation. Windings protected by the extruded resin cannot loosen, being permanently anchored to the stator frame.

Even though the motor has the open-type frame, it may be used as a splash-proof motor and as a totally enclosed motor in many applications. **For more information write or call: Lincoln Electric Co., Cleveland 17, Ohio.**

Mud Pump Added to GX Line

The new 500-hp. Model GXN is a 14-in.-stroke mud pump with 7¼-in. diameter fluid cylinders. The GXN has been designed with heavy-duty bronze sleeve jackshaft bearings, eccentric and crosshead pin bearings. These large bearing areas reduce unit bearing loads and give long service under the shock and high-load conditions. The connecting rod has been designed as one-piece to eliminate the possibility of bolt failure under load.

Two chain-driven positive displacement pumps, assembled in the completely enclosed power end, insure a supply of lubricating oil to the bearing surfaces. A packed oil-stop head and a large piston rod baffle prevent mud from entering the power end. The piston-rod extension is threaded and locked in the crosshead to prevent parts from working loose.

The fluid end is designed with divided fluid cylinders, with completely interchangeable right and left-hand cylinders. Either bolted or screwed cover plates are available. To assure an equalized flow of mud to all valves, a 10-in. flanged suction manifold is furnished.

When operated at the recommend-

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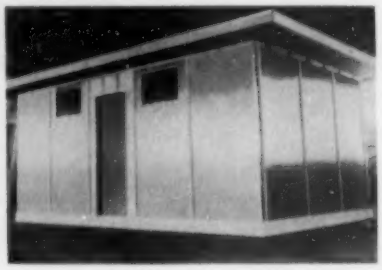
ed speed of 70 r.p.m. with master size 7¼-in. liner, the GXN displaces 666 g.p.m. and is suitable for pressure up to 1,094 psi. With reduced-size liners, the pump handles pressure up to 2,435 lb. **For more information write or call: Gardner-Denver Co., South Front Street, Quincy, Ill.**

●

Lock-Rite Building Made For Fast Portability

This structure is designed for extremely high desert temperatures as well as severe conditions due to high winds and blowing sand. All lumber used is specially treated. The aluminum is sprayed to prevent any possible harm either during shipment or use. The unit is designed to be packaged in small increments.

These units are easily assembled and disassembled so that during the many changes made during exploration they can be assembled and reassembled in a minimum of time with native labor.



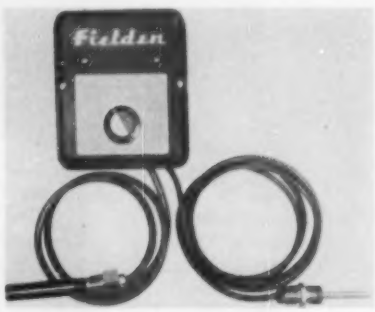
These buildings are easily adaptable to many uses. The one shown is a two-man living unit, but it can also be used as a recreation room and combination galley and mess hall with the addition of specially designed panels which prevent movement from one building to the other without going outside.

. A packaged electrical-circuit system consists of all special outlets, fixtures for lighting and wiring, and a pigtail extending outside for simple connection to camp generators. **For more information write or call: Lock Rite Structures, Inc., Mill Street, Lawrence, L. I., N. Y.**

Conductivity of Solutions Controlled by Instrument

A new electronic instrument for controlling the conductivity of solutions fills the need in industry for a low-cost, solution - conductivity controller where recording is not required. The instrument can be employed in controlling water purity, presence of specific chemicals in solutions and process baths.

The controller is equipped with two-zone action for both alarm or control. A single set-point knob on the front provides control within the range



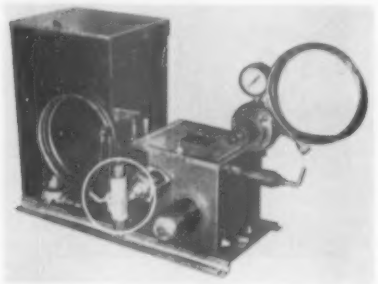
of the instrument calibration. It is available in two standard ranges of conductivity: 0 to 30 micromhos/cm3,

"Otis... First in Pressure Control"

or 20 to 200 micromhos/cm3, for use with conductivity cells having a constant of 1. The scale calibration is nonlinear and provides maximum readability at high specific conductivities.

Accuracy of the instrument is ±0.5 per cent of full scale. It has a sensitivity of ±0.1 per cent of full scale. **For more information write or call: Fielden Instrument Division, Robertshaw-Fulton Controls Co., 2920 North Fourth Street, Philadelphia 33, Pa.**

●



Chemical Injector Has Corrosion Resistant Head

Series 1200 (S-beam type) and Series 3700 (gas-driven type) chemical injectors have pump heads made of Meehanite castings instead of brass or bronze. All pump packings are now of Hycar.

The new Meehanite heads offer greater resistance to a wider range of corrosive action. They satisfactorily handle compounds commonly used for emulsion breaking or corrosion-injection service.

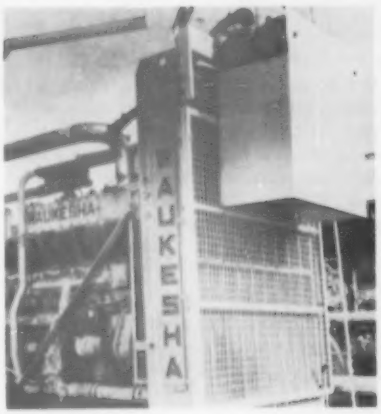
The new injector heads may be used on 1000, 1100, 3500, and 3600 chemical injectors; however, the new Hycar packing is not adaptable to these heads. **For more information write or call: Texsteam Corp., 320 Hughes Street, Houston, Tex.**

●

Radiator Water Provided By Exhaust Condenser

This model CD exhaust condenser is designed for use on large gas, gasoline, or L.P.G.-fueled drilling engines, pipeline engines, and gas compressors.

A costly factor in engine maintenance is the internal radiator clogging and engine scaling from mineral deposits. This can be eliminated by the use of the exhaust condenser. The condenser makes water from the exhaust gas by condensing from a small portion of the exhaust the water formed in combustion. Incorporated in the condenser is a purifying stage to remove undesirable combustion byproducts.



The necessity of piping, transportation, or storage of water for radiator makeup purposes is eliminated. By the use of the exhaust condensers in conjunction with the automatic oil-supply systems, it is frequently possible to eliminate daily inspections that were previously required for the sole purpose of providing daily radiator water, and lubricating oil makeup.

The Model CD exhaust condenser is made of cast-aluminum components designed for mounting directly on the engine radiator and includes, as standard equipment, a cooling-air shroud and an exhaust back-pressure regulator

Easy to Run and Pull • Positive Lock • Positive Seal. The new Otis "Selective" Collet Packer employs the same principle of a "selective" landing nipple and pack-off assembly as used in Otis sub-surface controls. The tool has three principal parts: A *casing landing nipple*, a *packer body*, which seats in the nipple, and a *seal mandrel*, which lands in the packer *(see illustration)*. The packer body is locked in position with a heavy-duty collet hold-down and sealed off by sturdy V-type packing. The packer body also has "selective" keys to position the assembly in a specific landing nipple. The seal mandrel and packer body can be run and set together on the tubing, or the packer body can be run on a wire line and the installation completed when tubing is run.

The tool allows the tubing to be raised for circulation or it can be reset in another nipple at another interval, or easily pulled if a drill string, instruments, or other tools must be run in the well. The packer also has special advantages in permanent completions and in crooked or directional holes. Due to the collet locking design, rotation of the tubing is not necessary to set the tool. No slips are used which might damage the casing wall or corrode to a tapered mandrel.

Your nearest Otis office will be glad to tell you about other operating features of this new packer, give you illustrated literature, and discuss with you how the tool may be adapted to your completion program. There is no obligation, and you will find our field men anxious to help you in any way they can. Call one of these Otis offices:

Abilene • Beaumont • Conroe • Corpus Christi • Dallas • Falfurrias Gretna • Hattiesburg • Hobbs • Houma • Houston • Lake Charles Lindsay • Longview • New Iberia • Odessa • Oklahoma City • Palestine Pauls Valley • Shreveport • Victoria

OTIS PRESSURE CONTROL, INC.

NEW OTIS LANDING NIPPLE PACKER

to maintain continuous function of the exhaust condenser under widely fluctuating engine speed and load conditions. The condenser has a rated water production of 6 to 8 gal. per day. **For more information write or call: Power-Plus Corp., 4450 East Washington Boulevard, Los Angeles 23, Calif.**

●

Fewer Welding Passes Needed With Insert Rings

Inert-gas tungsten-arc welding of piping without backing rings, smoother root-pass welds with elimination of root-pass cracking, and improved weld contours in thin-wall piping with one or two less passes, are some of the benefits offered by a line of new consumable solid insert-rings.

On piping of wall thickness over ¼ in., the welding insert ring assists in obtaining root-pass welds of uniform and smooth contours, free of crater and center-line cracks. The completed root-pass weld provides an effective backup for the subsequent shielded metal-arc welding with covered electrodes.

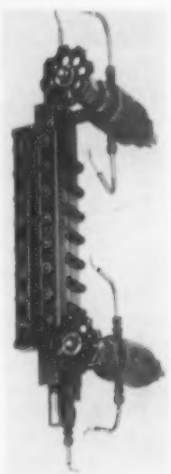
On thin-wall piping, such as Schedule 5 and 10 stainless steel, the welding insert ring improves weld contour.

OIL and GAS JOURNAL *Showcase* OF NEW EQUIPMENT

On many sizes, the insert ring also eliminates the need for separately supplied filler metal and the necessity for one or two additional weld passes. **For more information write or call: Industrial Piping Division, Grinnell Co., Inc., Providence, R. I.**

●

Electrically Heated Gages Are for Cold Weather Use



This electrically heated unit has been developed to meet the demand for heated gages and valves where there is no steam available. These new electrical units are ideal for heating cold liquid to get an accurate reading or in cold-weather applications to prevent gage freezing and breakage. The system also is valuable where there is need for very close control of temperatures in the gage glass. An electrical unit may be installed with a temperature control or thermoswitch positioned within the gage column to regulate the amount of heat output of the electrical element.

Gages are available in double-chamber reflex or external-tube transparent gage models in various sizes and pressure groups. Any of the above units may be furnished in any material required to meet corrosive conditions.

Where explosionproof construction is required, the electrically heated units

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Engineered answers to oil well cementing

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can be adapted to the requirements of the Underwriters' Laboratory. **For more information write or call: Jerguson Gage & Valve Co., 80 Fellsway, Somerville 45, Mass.**

●

Casing Adjuster Protects String From Strata Stress

A new, nonrotation type of casing and liner adjuster is made up in the string and protects casing or liner from damage due to stratigraphic compaction, shear, and subsidence. By either extension or contraction, the length of the string is adjusted to distribute or relieve undue stress.

The casing adjuster and liner adjuster consists of two basic units: the inner mandrel equipped with external splines which afford rotation to the string for makeup or breakout; and the outer case with shear pins controlling axial movement.

The adjusters are normally landed with shear pins holding the mandrel in a neutral position. Movement can then be accomplished by the tool in either direction to compensate for compaction or tension. Shear pins are specified to allow movement of the adjuster before stress reaches a point that will damage the slotted casing or liner screen.

To help in landing a long string of casing, the shear pins are omitted from the casing adjuster and it is used as a bumper sub. **For more information write or call: Creighton Oil Tool Co., P. O. Box 7143, Long Beach 7, Calif.**

●

Gasoline Engine Develops 5.5 Hp. at 3,600 R.p.m.

A new single-cylinder, air-cooled, four-cycle, gasoline-powered engine develops 5.5 hp. at 3,600 r.p.m. Weighing only 86 lb., this compact engine has a 2¾-in. bore; 2½-in. stroke; 14.9-cu.-in. piston displacement; and a compression ratio of 6.25 to 1. It has a removable aluminum-alloy cylinder head and a fully counter-weighted, balanced crankshaft. The engine has high-

SAVED $126,360.00

REPLACEMENT COSTS ON 28,430 FEET OF PIPELINE

In August of 1953, Internal Pipeline Maintenance Company internally coated 15,430 feet of badly deteriorated 8″ Naylor spiral weld pipe. Part of a 28,430-foot pipeline connecting a gasoline plant and a carbon black plant, this line, transporting sour residue gas, was in such critical condition that the problem became a question of deciding between replacing the entire line with new pipe or internal cleaning and coating so that operations could be continued.

It was decided to clean and coat the line, and that the coated section would be considered a test of the IPM process.

By April of 1955, results on the 8″ section had proved so satisfactory that it was decided to coat the remaining 13,000 feet. This section was made up of 12″ Naylor spiral weld pipe.

The entire cleaning and coating operation was completed at a total cost of only $23,640.00. Cost of replacement with new 10″ pipe was estimated in excess of $150,000.00.

Not only has the coating given trouble-free service, but it eliminated entirely the need for replacement. By calling in IPM, the operator realized an outright saving of $126,360.00—in addition to savings in maintenance.

the company with the longest continuous service experience in its field

Internal Pipeline Maintenance Co.

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(THICKENED OIL)

for better, deeper fracturing

T-O is our low-cost fracturing fluid that is made up on-location with crude oil, kerosene, or Diesel oil. Because it has so many desirable physical and chemical properties, T-O is often called "the ideal fracturing fluid." Only about 2 per cent gel is used to compound most T-O fluids, and the batch is ready for use within 30 minutes after mixing has begun. T-O contains an internal breaker for faster, more complete clean-up, and the fluid leaves no deposition in the well or the formation. T-O has a high viscosity and good sand-carrying ability, and a low fluid loss for deeper and better fractures. It also has a low friction loss, which means lower injection pressure is required. T-O is completely compatible with demulsifying agents or other additives.

T-O and the 24 years' experience of The Chemical Process Company have increased production in hundreds of wells. This combination could probably make a better well for you, too. Before your next frac job, talk to your nearby Chemical Process station about T-O, or write to us in Breckenridge, Texas. We'll be glad to give you additional information on T-O and many other CPC services and treating fluids without obligation.

Case Histories *A Morrow sand well drilled in Texas County, Oklahoma, showed only a rainbow on natural test. After fracturing with 15,000 gallons of T-O (1 lb. of sand per gallon), the well tested 504 B.O.P.D. ▼ A gas well in the Tonkawa sand in Hansford County was fractured with 10,000 gallons of T-O (1 lb. of sand per gallon). Deliverability was increased from 5,500 M.C.F. to 43,000 M.C.F.*

THE CHEMICAL PROCESS CO.

THE CHEMICAL PROCESS CO.
SERVICING OIL & GAS WELLS

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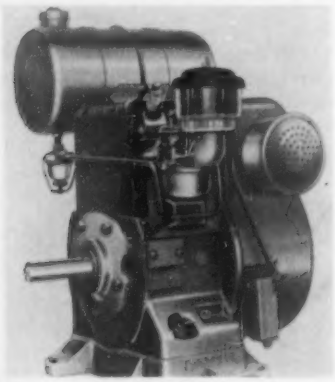
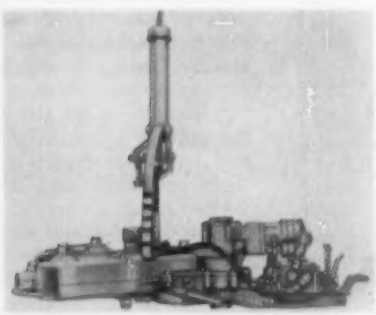


tension magneto ignition. It is started by means of a manual pull rope, although recoil starters or electric starting are available. **For more information write or call: D. W. Onan & Sons, Inc., Minneapolis 14, Minn.**

●



New Power Tubing Tong Has Roll-Over Feature

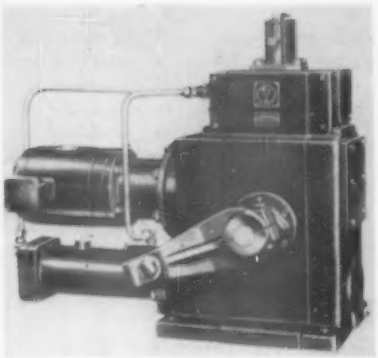
A new lightweight, low-priced tubing tong has been added to a full line of power-operated oil tools. Designated the Model S, the new Hydratorc will be a companion tong to the present Model R Hydratorc.

Designed to effect savings in weight, the new Model S contributes to easier handling. A roll-over feature is provided for reverse operation. **For more information write or call: Byron Jackson Oil Tools, Box 2017A, Terminal Annex, Los Angeles 54, Calif.**

●

Hydraulic Regulator Has Wide Range of Signals

A self-contained hydraulic regulator develops a powerful correcting action in response to a wide range of signals. The new unit, called Powerpack, is well suited for relief and reducing-valve applications involving lever or butterfly valves. It is also employed



for the control of fluid flows and as a remote valve positioner.

The regulator can be used on liquid-level applications, feed-water pumps, steam-pressure reducing stations for pressure control, flow control, and as an antisurge governor for blower installations. Its corrective action is greatly increased near the closed position of the valve. This gives the extra power needed to shut valves tight or break sticking valves loose. **For more information write or call: Askania Regulator Co., 240 East Ontario Street, Chicago 11, Ill.**

●

Packaged Pump Shows 80 Per Cent Efficiency

A new pumping unit for wells as small as 4 in. in diameter is pre-engineered for ordering by unit number and delivery as a complete package. There are two sizes, 4-in. and 6-in.

Laboratory tests have resulted in efficiences of over 80 per cent. These pumping units are available in sizes from 2 through 7½ hp.; heads to 340 ft.; capacities from 200 to 7,500 g.p.h.

The General Electric VHS weatherpoof motor provides 60-cycle, 3,600-r.p.m. operation. Cast-iron surface discharge head has bronze-bushed stuffing box and 2½-in. i.d. threaded discharge. Column and shaft assembly is equipped with 5-ft. bearing centers, ¾-in. stainless-steel shaft and rubber bearings. Bowls are of cast iron, the semi-enclosed impellers are of bronze, and the shaft is of stainless steel. **For more information write or call: Layne & Bowler Pump Co., 2943 Vail Avenue, Los Angeles 22, Calif.**

Portable Rotary Drills Designed for Slim Holes

Two new portable rotary drills for use in slim-hole production and exploration drilling are truck or trailer-mounted.

The Model 510 is designed for drilling to a depth of 5,100 ft. with 3½-in. drill pipe. Features include an oil bath rotary table with 18-in. opening and A.P.I. taper, air-operated clutches, hydromatic brake for hoisting drum, and 85-ft. mast with 80 ft. of clearance between top of rotary table and bottom of crown block, capable of pulling Range 2 doubles.

The Model 340 is designed for drilling to a depth of 3,400 ft. with 3½-in. drill pipe. It features an oil bath rotary table with 12-in. opening and A.P.I. taper, air-operated clutches optional hydromatic brake for hoisting drum, a 65-ft. mast with 57 ft. of clearance between top of rotary table and bottom of crown block, capable of pulling Range 1 doubles with the standard mast. **For more information write or call: Joy Manufacturing Co., Henry W. Oliver Building, Pittsburgh 22, Pa.**

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Trademark Registered

LIGHT as a feather— TOUGH as a boot!

Precision-engineered for heavy duty work under most difficult shop and field conditions, H & M Pipe Cutting and Beveling Machines — regardless of size — are increasing in demand *wherever pipe is used.* The trademark of H & M is your constant assurance of dependability backed by service — *imperative to profit* on your jobs.

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- ★ PROFITABLE: cuts labor and gas as much as 50%.
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- ★ SPEEDY: cut and bevel any pipe in minutes!

OTHER H & M TIME-SAVERS

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- ★ "OUT-OF-ROUND" — for perfect cuts on "out-of-round" pipe.
- ★ "FLEXIBLE SHAFT" — perfect accuracy with 1 man cutting any size of pipe.
- ★ PIPE DOLLIES — for safety, speed, accuracy in pipe fabrication.

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OIL AND GAS JOURNAL

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- CATALOGS
- BROCHURES

Internal Coating for Pipe. A colorful, illustrated, eight-page booklet, No. 459, describes internally coated drill pipe and tubing. The internal coating prevents corrosion and fatigue failures and minimizes paraffin accumulation. New manufacturing techniques are also shown. **For more information write or call: The National Supply Co., 2 Gateway Center, Pittsburgh, Pa.**

●

End-Suction Centrifugal Pumps. New Bulletin 4011-A describes the complete line of redesigned and resized end-suction centrifugal pumps. The bulletin includes Figs. 4011 and 4021, representing different power ends, to which numerous sizes of liquid ends can be attached. Performance tables and curves in the bulletin list characteristics of all possible combinations. Separate alloy liquid-end construction is available on most sizes for handling liquids that are abrasive or corrosive, and liquids carrying lime, chips, and other solids that cause unusual pump wear. **For more information write or call: The Deming Co., Salem, Ohio.**

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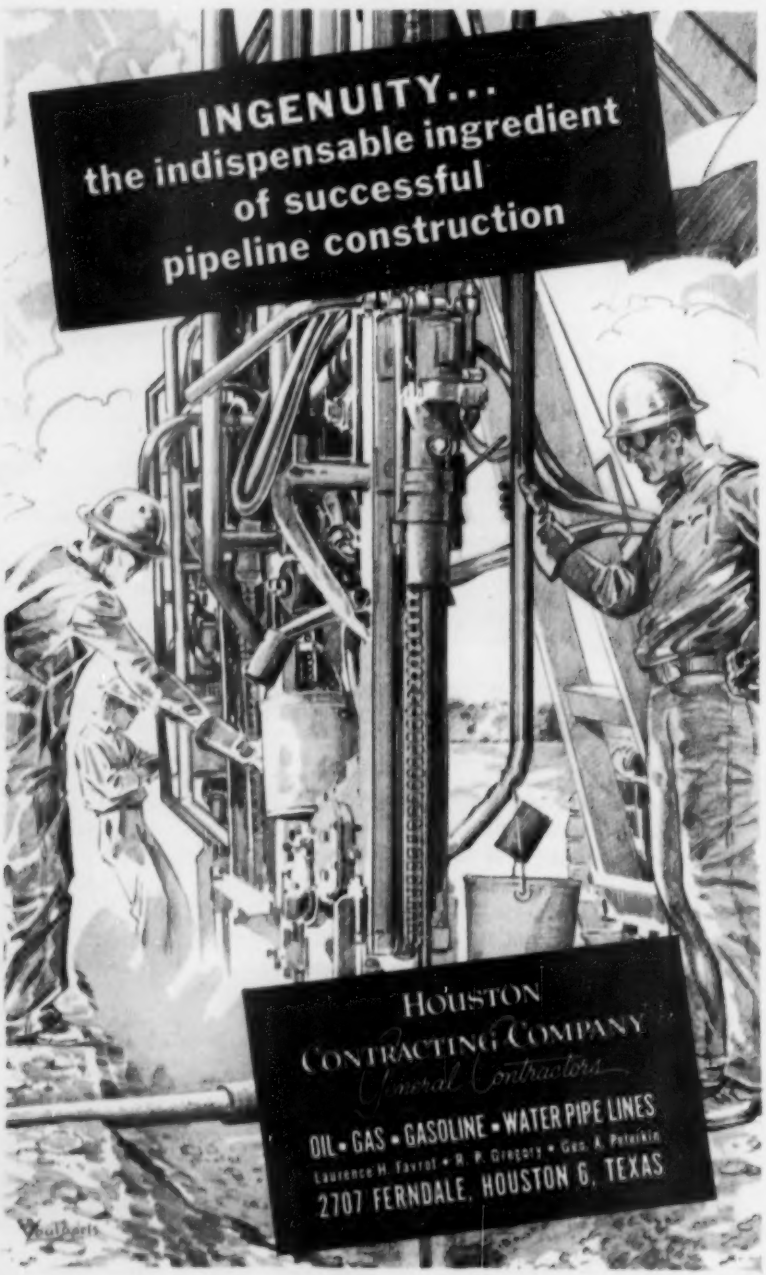

Fresh Water From Sea Water. New heat evaporators transform sea water into fresh water at no fuel cost but utilizes the waste heat from diesel engines or gas turbines. Information on five models with capacities 300 to 2,100 g.p.h. is now available in the brochure entitled "Fresh Water by the Ton." The brochure contains a comparison chart showing savings possible with a Cleaver-Brooks waste-heat evaporator when compared to vapor compression or multieffect evaporators and barged-in water. It tells how offshore drilling operators can save up to $25,000 a year by producing fresh water from sea water on board at no fuel cost. **For more information write or call: Cleaver-Brooks Co., Special Products Division, 326 East Keefe Avenue, Milwaukee 12, Wis.**

●

Pfizer Products in Secondary Oil Recovery. Citric acid, a versatile basic chemical is now being put to work to help solve a production problem in the petroleum industry. Tests have shown that when citric acid is incorporated into injection water it successfully curbs costly iron plugging, one of the major causes for flow stoppage. Citric acid's value is its ability to preferentially sequester iron and thus prevent the precipitation of insoluble iron salts in the presence of other metallic ions such as calcium and magnesium. **For more information write or call: Charles Pfizer & Co., Inc., Chemical Sales Division, 630 Flushing Avenue, Brooklyn 6, N. Y.**

●

Faster Drilling by a Good Bit. A complete line of cone bits ranging in size from 3¼ to 7⅞ in. is described in this two-color, 12-page booklet. Details on tooth design and bearing assemblies are given. Fourteen bits are covered, giving sizes and applications. Both mud and air bits are illustrated. **For more information write or call: Oil Tool Manufacturing Co., Tonkawa, Okla.**

●

Two-Zone Pump Guide. A two-zone pump is described in a new bulletin,

Years of trouble free service

ORBIT'S

POSITIVE SEATING
POSITIVE STEM PACKING

The Orbit Valves in this installation have given years of trouble free service.

Positive shut-off has been maintained during all these years. The Plastic Stem Packing has never had more than a single, simple adjustment.

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with the "Varec" Fig. No. 2500 AUTOMATIC TANK GAUGE

View of the new Watson terminal of the Southern Pacific Pacific Pipe Line. "Varec" Fig. 2500 Series Gauges are used on the entire line from El Paso to Watson.

After two years of research, development and testing at the plant and in the field in several types of service, the first "Varec" Figure No. 2500 Automatic Tank Gauge was sold in February 1952.

Since that time several improvements have been made. Now there are over 4000 of these Gauges in all kinds of service throughout the world.

This phenomenal volume resulted because the "Varec" Figure No. 2500 *first* introduced the Neg'ator Motor to the Petroleum Industry. The Neg'ator Motor is a novel spring mechanism that is stressed sequentially by increments and NOT by winding, in contrast to the conventional spring. It is a self-winding spring and maintains constant tension throughout float travel. It eliminated calibrated tapes, counter-weights and slip joints, thus providing easy installation.

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Provides for attachment of remote transmission systems or high-low control switches (either electric or pneumatic). Unnecessary to remove tape for punching, or to buy a new tape. Remoting equipment mounted outside Gauge Head without dismantling the Gauge Assembly.

Serves all types of tanks up to 66 feet in height and pressures to 300 p.s.i.g.

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Compton, California, U. S. A.

Cable Address:
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A-247, which contains information supplemented by cross-section and formation drawings. The two-zone pump was developed to provide a means by which the operators of dually completed oil wells could pump one or both producing formations, simultaneously through the same well bore, without commingling the fluids. It was also designed to provide a means by which the operators of singly completed oil wells could recomplete their wells as dual producers. **For more information write or call: Emsco Manufacturing Co., Box 2098, Los Angeles 54, Calif.**

●

Down-Hole Separator for Pumping Wells. The down-hole separator which increases production and eliminates the problem of gas locks in pumping wells is illustrated and described in a one-page, two-color bulletin punched for ring-binder filing. Method of installation is fully outlined and illustrated by a schematic drawing. The bulletin also includes complete engineering data, prices, and ordering information. **For more information write or call: The Guiberson Corp., P. O. Box 1106, Dallas 21, Tex.**

●

Automatic Tank-Switching Controls are illustrated and described in the eight-page, two-color Bulletin CP-3030. Both pneumatic and electric controls are shown. Such equipment as tank gages, level controls, control switches, and programmers are covered. Remote gaging and control systems are also shown. Sectional drawings are utilized to show operating details. **For more information write or call: Vapor Recovery Systems Co., 2820 North Alameda, Compton, Calif.**

●

Fluid-Loss Additive. The control of fluid loss during fracturing operations is the subject of this new six-page development brochure. Text material and data tables present such information as: effect of fluid-loss additive on various crude oils; solubility of fluid-loss additive; effect of temperature, water, and acid on fluid-loss additive; and concentration of additive required. **For more information write or call: Dowell Incorporated, Box 536, Tulsa, Okla.**

●

Seatless Piston Valves are shown in a four-page leaflet. Such valves can be serviced in the line. Since they have no seat there is no need for regrinding. The valves are also unaffected by wire-drawing or throttled openings. Gunmetal, forged-steel, and cast-iron or cast-steel types are described. Length, weight, and operating pressures at dif-

MOVING DRILLING MUD *FAST!*

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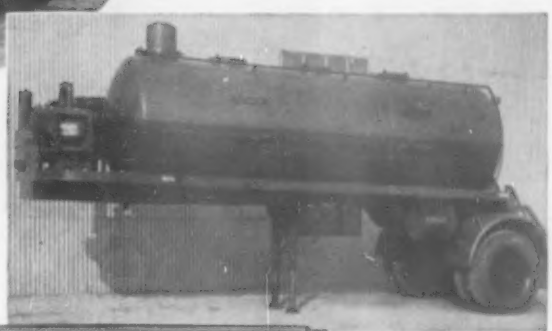
TO THE NEXT HOLE

From there to the next hole was discounted as driving time. Starting the stop watch again when the driver had backed up to the shaker pit, the one man laid hose, opened the valve and had the tank empty in 4 minutes 10 seconds.

This new Vacuum Tank Trailer, complete with engine and pump, is now available. Write for specifications and price!



GET ALL THE FACTS

There's a Thompson Unitized Vacuum Tank built to do your jobs fast, too! Cleaning tanks, draining sumps, pumping out cellars, agitating mud, spraying roads, weeds, etc., are everyday chores for this workhorse. Check UVTs: 20-100 bbls. capacity; truck, trailer, semi-trailer or skid mounted.

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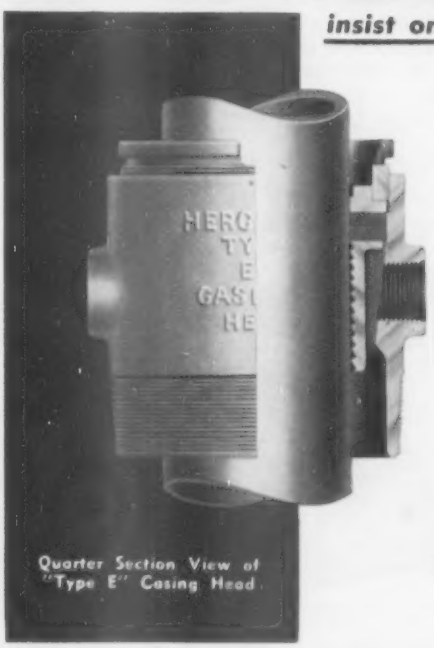
For Economically Supporting and Packing off
CASING STRINGS IN WELLS OF MEDIUM DEPTH AND PRESSURE



Quarter Section View of "Type E" Casing Head.

insist on **HERCULES "TYPE E" CASING HEAD *(with slips)***

Constructed from pressure cast steel and hydrostatically tested to 3000 psi. Pack-off is accomplished with Hercules ORIGINAL OVERHEAD PACKING. The three-piece hinged slips insure even gripping action and facilitate installation. All sizes are full-opening, allowing passage of centralizers, packets, etc. The packing nut acts as a thread protector and is provided with notches to accommodate a wrench or pinch bar. The recommended maximum load is 200,000 lbs. Write for complete information and range of sizes.

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MANUFACTURERS OF OIL FIELD EQUIPMENT SINCE 1924
GENERAL OFFICES AND PLANT TULSA, OKLAHOMA
Export Representative: Oil Field Equipment Co., Inc., 30 Church Street, New York 7, N. Y.

ferent temperatures are shown. **For more information write or call: Richard Klinger, Ltd., Klingerit Works, Sidcup, Kent, England.**

●

Orifice Plates. Bulletin P-101 gives details and ordering information on orifice plates, holders, and flange unions. Data tables show specifications of the nine handle-type, ring-joint, orifice-plate holders, and 14 sizes of paddle-type, orifice-flange plates. Also shown is a table giving the details of universal orifice disks. One page is devoted to a table of orifice-bore calculations to help the engineer. **For more information write or call: Maintenance Mechanical Corp., P. O. Box 2637, 3711 Clinton Drive, Houston 20, Tex.**

●

Eleven Ways to Save Drafting Time compiles the many ways of using intermediates to make quick modifications of drawings without changing the original. The booklet discusses 11 specific ways to use intermediates, with each of the time-saving techniques clearly illustrated. Brief copy takes the reader through every step of the process. Among topics covered are scissor editing, masking, the block-out method, successive additions, and preprinting. Other methods shown are transparent matte tape, pick-off transfer, composite grouping, composite overlays, nonreproducible blue, and the use of corrector fluids. The techniques described apply to various print-making methods such as moist-developed process, ammonia process, blueprint, sepia negative, and even reproduction cloths in some instances. **For more information write or call: Frederick Post Co., 3666 North Avondale Avenue, Chicago 18, Ill.**

●

Johns-Manville Insulations is a new 20-page catalog on thermal insulations and refractories for general industrial applications. This factual catalog, organized for quick reference, provides information on the composition, physical and thermal properties, and sizes of the various products. It lists outstanding benefits at the time of installation and in service. It covers materials for the efficient control of temperatures from —400° F. to 3,000° F. **For more information write or call: Johns-Manville, 22 East Fortieth Street, New York 16, N. Y.**

●

Shield-Arc Engine-Driven Welders. A new eight-page, two-color bulletin gives details on six models of industrial welders. Specifications are given on each model including N.E.M.A. rating, current range, horsepower, operating speeds, and weight. Other information includes portability, auxiliary power, remote control, and special equipment. These welders are widely used in pipeline and structural work. They feature a single-operator, variable-voltage design with a laminated magnetic circuit. **For more information write or call: The Lincoln Electric Co., Cleveland 17, Ohio.**

●

How to Reduce Gas-Scrubber Costs Up to 500 per cent. A new four-page folder, Bulletin 710, describes how these new Hi-eF gas scrubbers recover virtually 100 per cent of the recoverable liquid present in butane, methane, propane, and other hydrocarbon gases at one-fifth the cost of conventional gas scrubbers. A cutaway drawing, together with a description, shows how each unit operates without employing moving parts, filters, or mesh screens of any type. The folder contains complete specification data on 150, 300, and 600-psig. scrubbers. **For more information write or call: The V. D. Anderson Co., 1935 West Ninety-Sixth Street, Cleveland 2, Ohio.**

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OIL PROPERTY VALUATION

by PAUL PAINE, a consulting engineer with many years' experience in the oil production business

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Oil properties and oil property interests . . . with definitions, examples, lists of required data, and a useful table giving the products of customary fractions used in dividing oil-property interests.

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The examination and report . . . gives practical directions on how to go about a job, the examination of accounts, and the preparation of a report.

204 pages
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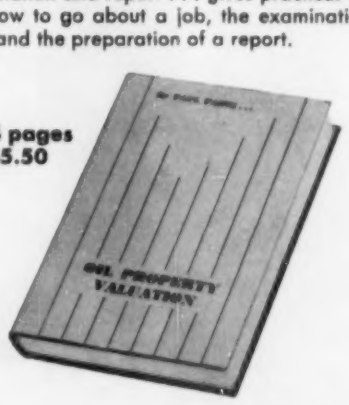

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THE OIL AND GAS JOURNAL

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EQUIPMENT MEN . . . in the News

From left to right: W. T. Powell, president, Emsco Manufacturing Co.; J. M. Tuthill, general manager of sales, The Youngstown Sheet & Tube Co.; and F. I. Brinegar, executive vice president, Continental Supply Co.

Left to right: J. A. Mussler, general manager of sales, Continental Supply Co.; and J. H. Bascom, president, Broderick & Bascom Rope Co.

Continental Holds 16th Sales Meet

Continental Supply Co.'s sixteenth annual sales meeting, held in Dallas recently, was attended by representatives of Continental's associated manufacturers and by 175 Continental men from the United States, Canada, and South America.

Business session conducted during the first day concerned the various phases of merchandising drilling equipment, production equipment, and tubular goods. In addition to these business meetings, a tour through Emsco Manufacturing Co.'s D+B Division plant at Garland, Tex., was held for the visiting salesmen. Here they observed the operation used in the manufacturing of sucker rods and subsurface pumps.

J. M. Tuthill, general manager of sales, and Dr. Karl L. Fetters, assistant to the vice president, both of The Youngstown Sheet & Tube Co., were among the guests present. Continental is a division of Youngstown. Among other associated companies' officials present were: J. H. Bascom, president of Broderick & Bascom Rope Co.; Brinton Welser, senior vice president of Chain Belt Co.; W. C. McNitt, general manager of sales, Clayton Mark & Co.

Left to right: G. V. Leece, president, Gardner-Denver Co.; and F. M. Mayer, president, Continental Supply Co.

W. T. Powell, president, Emsco Manufacturing Co.; Jerry Hutchison, Fibercast Corp.; G. V. Leece, president, Gardner-Denver Co.; J. F. Hacker, vice president, Ladish Co.; P. M. Arnall, president, Lunkenheimer Co.

Robert A. Snyder, vice president, New Bedford Cordage Co.; J. A. Conlon, vice president, New York Belting & Packing Co.; C. K. Madison, vice president, Rockwell Manufacturing Co.; H. H. Peters, president, Technical Oil Tool Corp.; Bob Gaylord, assistant vice president, Wagner-Morehouse, Inc.

F. M. Mayer, president of Continental, and F. I. Brinegar, executive vice president, welcomed the group at the opening of the session. Dr. Fetters of Youngstown discussed nuclear energy and its application to the steel

Schlumberger's Field Managers Hold Annual Discussion

Schlumberger's 24 area and division managers assembled recently in Houston for their annual week-long meeting to discuss matters dealing with technique, service, and customer relations. Twenty-two of the 24 managers are present in the above photograph.

"Wherever there's oil you'll find Baird products on the job."

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Baird MANUFACTURING COMPANY
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TULSA, OKLAHOMA

CLEANOUT TAPS and DIES by BAIRD

for . . . tubing 2 in. to 4 in. plain or EUE — round or V-threads.

TUBING

for . . . all API and old style rods.

SUCKER RODS

for . . . piston rods, cross heads, valve cover and head studs.

SLUSH PUMPS

industry during the general meeting. The 3-day meeting was under the direction of J. A. Mussler, Continental's general manager of sales.

Well Equipment Starts New Plant Construction

Ground-breaking for Well Equipment Manufacturing Corp.'s new 76,000-sq. ft. office and plant in the Lumpkin Industrial District, Houston, is performed by Vic Norton, Weco's oldest employe in length of service.

Left to right: C. H. Callahan; J. C. McCelvey; Dan Parmesan; Art Schmitz, Food Machinery & Chemical Corp.; Vic Norton; John Gates; Russell Ford; J. H. Robinson; S. Knutson, general contractor; and Travis Broesche, architect.

After occupying its new plant in September, Weco will manufacture Chiksan products in addition to its own line of equipment for the oil industry. Well Equipment Manufacturing Corp. is an operating division of Chiksan Co., a subsidiary of Food Machinery & Chemical Corp.

Homco Announces New Oklahoma City Offices

Houston Oil Field Material Co. announces the opening of new offices at Oklahoma City. From this new location Homco will handle a complete line of directional-drilling equipment, fishing tools, electrical well-service equipment and oil-well-survey equipment.

Homco personnel at the new location are: Bill Redmon, district manager; H. C. Jones and A. B. Pruett, fishing tool supervisors; B. J. Breeden, directional-drilling sales representative; Bob Beams, electrical well service; and Junior Nolen, warehouse manager.

Long Ends S. A. Trip; OBI Appoints Sales Engineers

Jack Long, assistant general manager of Oil Base, Inc., Compton, Calif., has recently returned from an extended trip through Colombia, South America, where he visited OBI distributor, A. Z. Export Co. of Bogota. Next on Long's schedule was Venezuela, where he joined with OBI distributor Baritina de Venezuela, S. A. Purpose of the trip was to plan expansion of the sale of OBI products in the areas. This was Long's second trip within a year to these areas, in line with the company's policy of working closely with its distributors.

The appointment of Charles Allen and Joe King as sales and service engineers has also been announced by Oil Base, Inc. Allen will work in the Los Angeles Basin area with headquarters at Long Beach while King will cover the San Joaquin Valley.

Allen, formerly with Petroleum Engineering Associates in charge of fluid logging, is now being trained at the OBI laboratory. He has had 7 years of oil-field experience. King's experience has been in the drilling and production end of the business with mud experience over a period of several years.

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for Monthly Stock Lists

● VALVES
● PRESSURE TUBING
● STEEL

Peerless Supply Co., Inc.
L. D. 75 & 76 P. O. Drawer 36-A
Shreveport, La.

American Iron Announces South American Agents

American Iron & Machine Works Co., Inc., has appointed two sales agents in South America. Norman E. Yett and Verne Yett will represent American Iron in Venezuela. Yett was formerly with Officina Tecnica Stubbins in Venezuela and Continental Supply in New York City and Venezuela. The company, Norman E. Yett & Associates, will cover all oil-producing areas in Venezuela and will have headquarters at Caracas.

Pio Castagnoli will act as sales agent for American Iron in Brazil. His company, Sonda, covers the production areas within the country of Brazil with main offices in Rio de Janeiro.

Hercules Tool Adds to Office, Plant, and Staff

Hercules Tool Co. of Tulsa, manufacturers of oil-field equipment since 1924, has recently completed an expansion program, S. P. Tschappat, president, has announced. Work, started in 1955, resulted in enlarging the office building and plant, purchasing additional equipment, and acquiring adjoining ground for future expansion.

The supervisory personnel is as follows: L. C. Rhoads, vice president; Ivan L. Ingold, secretary and assistant treasurer; William H. Sage, Jr., who has been advanced to operations manager; Hoyt K. Anderson has been promoted to inventory-control manager; Charles E. Montgomery is the new office manager; Clarence E. Copeland, warehouse manager. Walter H. Cox and Thomas E. Marshall have been added to the sales staff.

McEvoy Co. Appoints Rainbo Sales as Southwest Agent

McEvoy Co., Houston, manufacturer of oil-field equipment, has announced the appointment of Rainbo Sales Co. of Oklahoma City as its agent for the states of Oklahoma and Kansas and the Texas Panhandle.

Rainbo Sales will carry a complete stock of McEvoy equipment, including valves, well-head equipment, christmas-tree assemblies, tubing and casing heads, and hangers.

U. S. Steel Supply Names Beasley as Representative

The appointment of Ralph T. Beasley as district product representative of alloy, stainless, and tubing sales for U. S. Steel Supply Division of U. S. Steel Corp. has been announced by

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Grating for Every Need
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for every Grating
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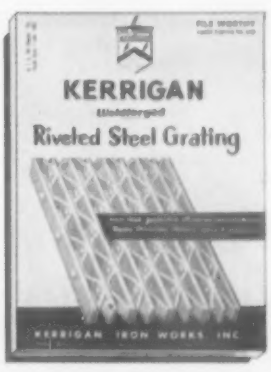
STEEL
for the 1001 applications where safety and strength come first. Kerrigan Steel Grating is BONDERIZED for corrosion resistance and extra years of life.

STAINLESS and MONEL
non-magnetic steel for the chemical, oil and packing industries . . . for ANY installation where high resistance to heat, acids, chemicals, and corrosion is needed.

TRULY . . .
In both size and type, there is a Kerrigan Weldforged grating for every need. Let our new catalogs prove it to you. Send for the one you think best answers your need (or ask for ALL FOUR if you wish). We will also be glad to send you a desk-size grating sample. Write Kerrigan Iron Works, Inc., General Sales Office, 274 Madison Ave., New York City.



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where it is desired to match existing grating.

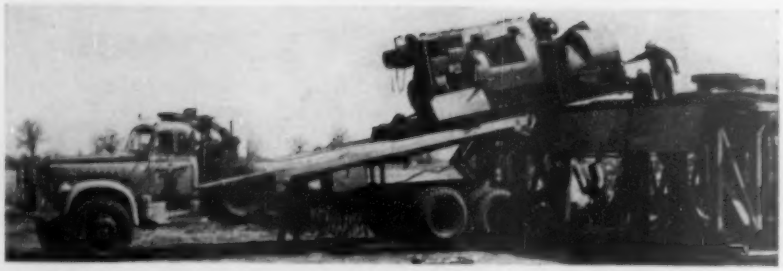
ALUMINUM
spark-proof for those whose need is strength AND lightness. Extra safe and strong. Allowable fiber stress 15,000 psi. Modulus of elasticity 10,000,000 psi.

KERRIGAN GRATING
CUSTOM-MADE FOR YOUR JOB AND SAFE—IT'S Weldforged

John P. Connor, district manager of the division.

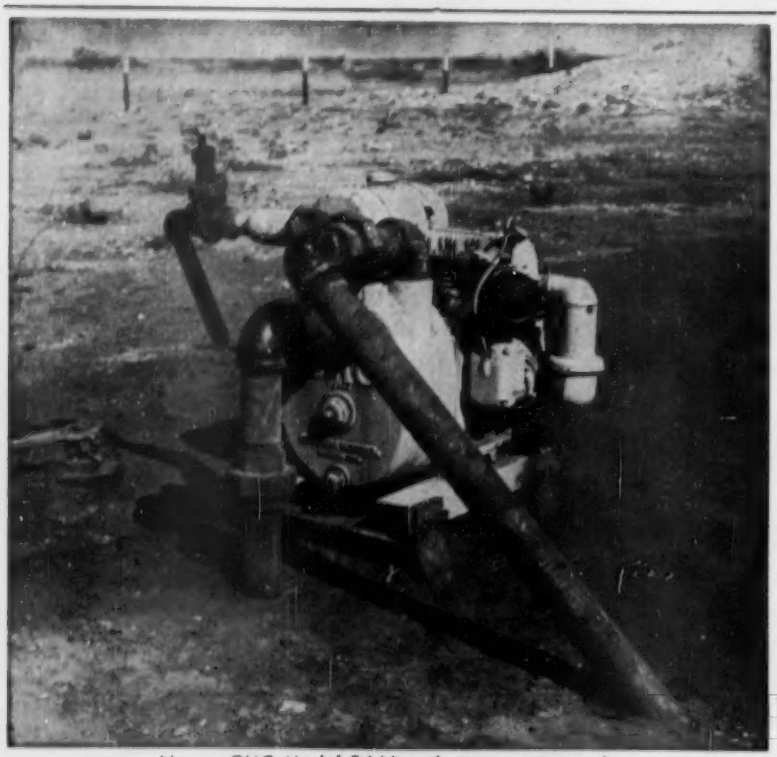
Beasley has been transferred to his new assignment from San Antonio, Tex., where he was sales representative for the supply division. He will headquarter in Houston. The supply division maintains warehouses in Houston and Dallas which serve Texas and Louisiana.

Beasley was given intensive training in alloy, stainless, and tubing products at the Chicago general offices of U. S. Steel Supply. He has been with U. S. Steel Supply since 1953, serving in a general sales capacity in the Houston district.



Hauling Contractor Uses Hydraulic Ramp on New Truck

Percy Jones, Inc., Oklahoma City, has recently purchased and is operating this new Diamond T tandem truck equipped with an hydraulic-lift bed specially designed for hauling drilling equipment. The truck has a 200-hp. Cummins engine, a ten-speed Road Ranger transmission, and an 8031 auxiliary transmission. The truck bed, manufactured and installed by Oil Field Truck Equipment Co., of Houston, is equipped with two winches and two 150,000-lb.-capacity hydraulic ramps. In addition to being safer and easier on the truck, this ramp bed speeds up the work of moving rigs from one location to the other by eliminating the need of constructing a temporary ramp for loading and placing heavy equipment.



Above, CMC Model 24-N gathering pump on the job at Fasken Field, Andrews County, Oklahoma.

For real workhorse performance plus economy and versatility—

DUAL PRIME PUMPS

• These pumps are especially built for oil field service in a large variety of sizes and models. Each Dual Primer is a compact, ready-to-run unit that can be used for either suction lift or booster pumping. Write for latest Pump Bulletin.
CONSTRUCTION MACHINERY COMPANY, Waterloo, Iowa.

Duke Joins Pazdral as Sales and Service Engineer

Jack L. Duke has joined the staff of Tod Pazdral Pipeline Specialties, according to Tod Pazdral, company president. Duke will serve as sales and service engineer in South Texas, South Louisiana, and South Mississippi.

Duke's pipeline experience includes 7 years of field and engineering work with utility and transmission companies.

Rogers, Higgins Named IBM Petroleum Representatives

The appointment of James H. Rogers, Jr., as applied-science representative and naming of Warren H. Higgins as special representative in the petroleum department have been announced by International Business Machines Corp.

Rogers will coordinate sales activities and planning of applications of IBM equipment to meet the needs of customers in the petroleum and public-utilities fields. He will also give talks and demonstrations on electronic computing, analyze customers' scientific and technical problems, and assist in the education of IBM and customer personnel. He will cover IBM branch offices in western United States, Alaska, and Hawaii.

In his new post, Higgins will coordinate sales activities and planning of applications of IBM equipment to meet the needs of customers in the petroleum field. He will also conduct classes for customer personnel and seminars for IBM sales representatives to keep them abreast of new machine accounting and data-processing techniques in the petroleum field.

Harnischfeger Names Parthum As Ad Manager

Charles F. Parthum has been appointed advertising and sales-promotion manager of Harnischfeger Corp., Milwaukee.

Parthum was formerly with The Buchen Co. of Chicago and before that with MacManus, John & Adams of Detroit and New York.

Patterson Foundry Appoints Darrah Sales Manager

The appointment of Richard D. Darrah as vice president and sales manager has been announced by Richard L. Cawood, president of the Patterson Foundry & Machinery Co. of East Liverpool, Ohio.

Formerly sales manager of the industrial-conditioning division of Dravo Corp., Darrah will have complete charge of all district offices and field representatives. His headquarters will be at the general office of the company in East Liverpool.

Hycalog, Inc. Appoints Bowerman General Manager

BOWERMAN

Max Bowerman has been promoted to the position of general manager of Hycalog, Inc., well-logging and diamond-bit-manufacturing firm of Shreveport, La., according to J. R. Mayeaux, president. Bowerman was formerly manager of operations. He recently completed 10 years with Hycalog. Starting as a logging engineer, he later served as district manager in the Corpus Christi area and then as manager of both the West Texas and South Texas districts, with headquarters in San Antonio. He was made manager of operations in 1952.

Also included in a general company reorganization was the placing in the hands of supply companies all sales of Hycalog diamond-coring and drill bits, core barrels, and barrel parts.

U. S. Industries Acquires A-1 Bit Tool Co.

U. S. Industries, Inc., has acquired the assets of A-1 Bit & Tool Co. of Houston for 34,770 shares of USI's common stock, John I. Snyder, Jr., chairman of the board and president of U. S. Industries, has announced.

A-1 Bit & Tool, which manufactures

Glitsch
Specialty
Fabrication for
Processing Plants
Whatever your requirements, you'll find valuable experience and modern, complete fabricating facilities at Glitsch. And once we do a job for you, we know you will call us back because you will like the way our "single engineering responsibility" complements your own production program. If you require any kind of specialty fabrication . . . for any process plant . . . call in Glitsch. Then you're assured of getting your job done right, and right on time.
If you would like more information on Glitsch fabricating facilities, write us at P. O. Box 6627 in Dallas and ask for a copy of our Catalog 155. There's no obligation of course.
We design and fabricate kiln internals for cat-cracking units, reactor and regenerator beams and baffles, special piping, welding, steel components . . . in fact any equipment which must be expertly engineered for weight and strength ratios or special construction.
Glitsch
FRITZ W. GLITSCH & SONS, INC.
Dallas • New York • Tulsa • Cleveland • Chicago • Houston • Los Angeles • Uxbridge, Canada

a line of special tools and valves used in the drilling and testing of oil wells, will retain its original name but will be operated as a branch of Garrett Oil Tools, Inc., division of U. S. Industries, Inc.

A-1 Bit & Tool's main plant is in Houston. It also owns and operates a plant in Tioga, N. D., devoted to the maintenance and repair of drilling rigs and fabrication of custom-made items for the drilling industry.

A-1 Bit & Tool was founded in 1932, and since then the company has diversified its line of products through its own research and through acquisitions.

Motorola Revises Sales, Names Vice Presidents

A major expansion of the national sales structure of Motorola Cummunications & Electronics, Inc., by establishment of four geographical sales divisions and the appointment of six vice presidents has been announced by Daniel E. Noble, vice president.

In the new alignment, Arthur L. Reese, formerly assistant secretary, was appointed vice president and operations manager.

Eugene S. Goebel, formerly national sales manager, was appointed vice president for market relations, with duties to include public and customer relations, and other special staff assignments.

Four former regional managers in the field were appointed vice presidents and placed in charge of the new sales divisions. They are: Lowell E. White, eastern sales division manager; Homer L. Marrs, central sales division manager; Edward L. Falls, Jr., southern sales division manager; and Donald F. Brickley, western sales division manager.

McCullough Appoints Loomis Sales Engineer at Casper

The appointment of Thomas J. Loomis as sales engineer at McCullough Tool Co.'s Casper, Wyo., service location has been announced by I. J. McCullough, president.

Loomis has been with McCullough 4 years. Before coming to McCullough, he was a draftsman for Ohio Oil Co. at Casper. As a former employe of Arctic Contractors, a seismograph company with headquarters at Point Barrow, Alaska, Loomis has aided in the search for oil near the Arctic Circle.

Bethlehem Boosts Underwood

The promotion of G. H. (Guy) Underwood to store manager and field representative at Wichita Falls, Tex., has recently been announced by Bethlehem Supply Co. Underwood was formerly machinery sales representative at the Wichita Falls store.

Los Angeles Nomads Induct Harold Smith as Associate

Harold H. Smith of H. C. Smith Oil Tool Co. (second from left) receives his lapel insigne during his induction as an associate member of the Los Angeles Chapter of Nomads from Art Marshall of the same company. To the extreme left is Sergeant-at-Arms Bill Brooks of Byron Jackson Co. and to the right is Tom Martin of R. J. Eiche & Associate, ritual master.

COMPACT
POWERFUL
DURABLE
QUIET

TULSA®
POWER TAKE-OFFS

A complete line of **low speed, medium speed, high speed, reversible,** and three series of **two speeds forward, reversible models** for every truck requirement.

FEATURING: strong, light-weight housings; forged, heat-treated gears; heat-treated shifter yokes; anti-friction bearings throughout, shaved gear teeth; double-lip shifter shaft seals, extremely low prices, nationwide distribution and service.

SEE YOUR NEAREST TULSA DISTRIBUTOR FOR COMPLETE INFORMATION AND PRICES

Tulsa Winch
TULSA, OKLAHOMA DIVISION OF VICKERS Inc.

Web Wilson Names Far East Sales Representative

The appointment of Earl Fuller as sales representative for the countries of Pakistan, India, Burma, British Borneo, and Indonesia, has been announced by Web Wilson Oil Tools, Inc.

For many years Fuller has lived in Bandung, Java, Indonesia, which will be headquarters for selling Web Wilson oil tools.

Welex Jet Promotes Walls to District Sales Engineer

Clyde E. Walls has been promoted to the position of sales engineer for the Falfurrias district office of Welex Jet Services, Inc.

Walls has been with Welex 5 years. In that period, he has worked through a series of positions, starting as a shopman and working up through the field jobs of rigman and shooter.

Jones Heads Newly Formed Automatic Power, Inc.

The organization of Automatic Power, Inc., Houston, has been announced by its president, N. H. Jones. The new business will manufacture packaged power units designed for unattended operation in remote locations where commercial power cannot be obtained. Major uses of the units will be to provide power for offshore operations, microwave stations, pipeline stations, and remote telemetering.

The principal work of the firm at this time is the manufacture of fog-signal units to warn vessels of the presence of offshore drilling structures.

Other officers in the new firm are R. C. Lockwood, vice president, and John Ryan, secretary and treasurer.

Bovaird Supply Promotes Sales and Store Personnel

Bovaird Supply Co. has made several promotions in its sales and store personnel. J. L. (Joe) Smith has been promoted to sales representative in the Denver regional office. R. T. (Gabby) Hayes has been promoted from field salesman to store manager at Liberal, Kans. Dewey Barnard, store clerk at Liberal, has been promoted to field salesman. B. J. Mitchell, at Bovaird's Pawhuska, Okla., store, has been promoted from store clerk to field salesman.

Smith succeeds James Kiker who resigned to enter the contracting business. Smith was formerly store manager at Liberal and field salesman at Great Bend, Kans.

SAFETY HANGS BY A HOOK

It's small and relatively inexpensive, but a hoist hook carries the full load —as much as a crane is designed to handle! All hooks may look similar, but Laughlin hooks offer a combination of features that make them outstandingly safe. First, they are forged from special bar quality steel, then accurately heat treated; finally, Laughlin's precision die design controls the metal's grain flow during forming to keep the elastic limits of the hooks at their proper ratings.

Next time you need hooks remember that *safety hangs by a hook*—and Laughlin hooks are the safest!

THE RIGHT COMBINATION

An exacting combination of design, steel and drop forging goes into Laughlin Shackles. A combination that results in maximum strength without brittleness that can result in fracture under shock load or in extreme cold. Pins used in Laughlin Shackles are forged from the same high quality steel —their extra hefty design makes them safer when shock loads accidently occur. When you see the famous Laughlin trade mark on shackles (and all other Laughlin fittings), you're seeing the mark of safety! Your nearby Laughlin Distributor has shackles in sizes from 3/16" to 3".

LAUGHLIN LINKS INSTALLED QUICKLY

Lower downtime—fast changeover is reported by companies using super safe Laughlin Double Clevis Links to couple standard and alloy chains to fittings. Users everywhere have cut out expensive, time-consuming welding and blacksmithing in favor of simple installation. Laughlin's heat treated Double Clevis Link attaches 1/4" to

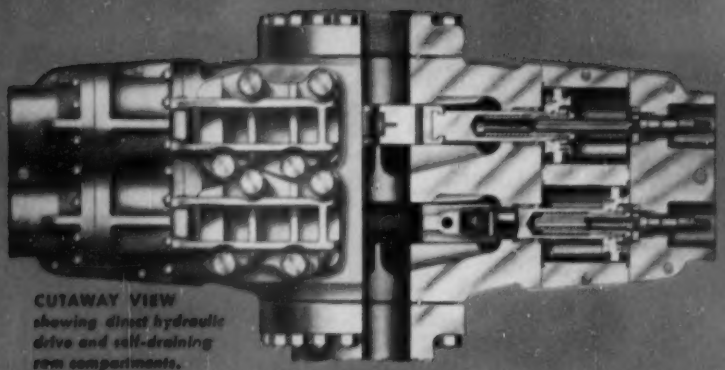
1/2" chain to rings, end and sling links, eye hooks, pad eyes, tractor eye bolts and other fittings.

The world's most complete line of fittings for chain and wire rope is described in the catalog available from your Laughlin Distributor, or Thomas Laughlin Division, American Hoist & Derrick Co., Portland, Maine.

SAFETY IN SIGHT

Ever worried about your crew forgetting the rated capacity of a block? You're free from worry and they're free from danger with Crosby "Load-Rated" Blocks because the load capacity is *embossed* in the side plates! A quick glance shows what the limits are —no chance to overload the block by mistake. Crews the world over are protected by Crosby "Load-Rated" Blocks —are yours? Crosby Products Division, American Hoist & Derrick Co., St. Paul 1, Minnesota.

(Advertisement)



CUTAWAY VIEW
showing direct hydraulic drive and self-draining ram compartments.

✻ When selecting cellar control gates, remember this... one gate may offer one feature — another gate, a different feature. But NO gate offers *so many* outstanding features as do Shaffer Hydraulic Cellar Control Gates!

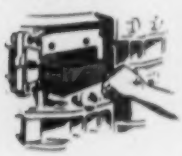
In Cellar Control Gates

You can't buy better than Shaffer!

FIRST SAFETY...

and on this extremely important point, every Shaffer product is backed by over three decades of experience and highest performance standards. But look for more than safety alone....

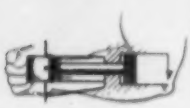
PLUS EASY RAM CHANGES!



As wells are drilled rams must be changed frequently to meet requirements of varying pipe sizes. In Shaffer Hydraulic Gates you simply open doors in the *side* of the gate, slide out the ram assembly, change rams, slide the assembly back in place and bolt the doors. It's that simple!

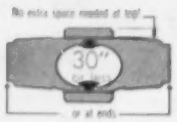
And equally easy ram changes can be made whether pipe is in or out of the hole.

PLUS POSITIVE, DIRECT DRIVE!



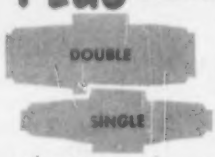
Shaffer Hydraulic Gates have no complicated hook-ups or secondary connections between rams and operating cylinders. Pistons are *directly behind* the rams for fool-proof operation, fewer parts, positive simplicity.

PLUS REAL COMPACTNESS!



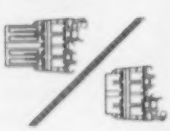
Shaffer Hydraulic Gates are not only amazingly compact in all three dimensions—length, width and height — but there's no need to expand critical end dimensions in order to change rams — nor need extra space be allowed above the gate to provide room for removing or inserting the rams. Even in sizes as large as 13⅝" (12" Series 900) Shaffer Hydraulic *Double* Gates require only 30" total height — *Single* Gates only 18½". Length and width dimensions are comparably compact!

PLUS SINGLE or DOUBLE DESIGN!



With Shaffer Hydraulic Gates you not only have a choice of Single Gates or Double Gates (two ram compartments unitized into one compact body), but both designs offer the same basic operating advantages, and many parts are interchangeable between the same sizes of Single and Double Gates.

PLUS RISING or NON-RISING SHAFTS!



Some operators prefer the "Rising" type of Locking Shaft because of its quick indication of ram position — others prefer the "Non-Rising" type for its greater compactness. Take your choice — Shaffer provides both to meet *your particular* preferences.

✻ Plus MANY OTHER ADVANTAGES! Get the *complete story from your nearest Shaffer representative — or write direct.*

See the Shaffer Section of your Composite Catalog.

Write for your free copy of the latest Shaffer Catalog!

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HIGH PRESSURE DRILLING AND CONTROL EQUIPMENT • FISHING TOOLS THAT EXCEL

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33 years OF OIL TOOL LEADERSHIP

Wolf Springs—A Montana Bonanza

by John C. McCaslin

The resounding success of Wolf Springs will encourage future drilling activity in East-Central Montana.

INDICATIONS are that the brightest development story in the Rocky Mountain province this year will be at Wolf Springs field, a 1955 Amsden-Lower Pennsylvanian discovery on the southern flank of the vast Central Montana uplift. An altered spacing pattern plus new pipeline facilities nearby have fired a fast-growing development program not seen in Montana since the opening of Poplar field in 1952.

Wolf Springs will grow . . . Everything points to a rapid growth of this field. In March the Montana Oil and Gas Conservation Commission set an 80-acre spacing pattern for the Lower Pennsylvanian reservoir. Previously, the commission had set a temporary 160-acre pattern.

The change was necessitated by an extension discovery 2½ miles south of Atlantic Refining Co.'s 1 Horton estate, the field discovery well. Carter Oil Co. completed the 1 Horton in C SE SE 29-7n-32e for 147 bbl. of oil per day on 16/64-in. choke. A second Carter well flowed 415 bbl. of oil daily on 20/64-in. choke. Atlantic's discovery well was completed last year flowing 386 bbl. of oil per day from the Amsden at 6,110-25 ft. Later, Atlantic completed a second well ½ mile north, and has drilling sites for a third well. The new field limits set up by the state commission take in both the Atlantic and Carter discovery areas.

The latest and most prolific addition to the field is DeKalb, Northern Oil Division 1 State, ¾ mile southwest of nearest field production. This well flowed oil at the estimated rate of 600-700 bbl. per day. DeKalb's well is 45 ft. lower structurally than the Wolf Springs discovery well. Location has been staked for a northwest offset to this big producer. Superior Oil Co. has entered the heated drilling race with two locations in the southeastern part of the field.

. . . Pipeline stirs activity. The new 6-in., 78-mile Powder River pipeline from Billings to Northwest Sumatra field adds further fuel to the Wolf Springs development.

The line passes through the east end of the Bull Mountain syncline near the field. This new outlet plus the untold potentialities of the Amsden reservoirs of the region promise that East-Central Montana will in all probability steal some of the drilling interest from other northern Rocky Mountain areas in the coming months.

. . . Further drilling encouragement. Lease ownership in the Wolf Springs area is diverse enough to speed evaluation drilling. This factor plus the relatively shallow drilling depths should encourage exploration by independent operators. These two factors have contributed to the high success in the Rockies' busiest basin, the Denver-Julesburg.

An exploratory milestone . . . The Wolf Springs discovery was the most important exploratory event in Montana since the opening of production and subsequent development at Poplar field in the Williston basin portion of the state 5 years ago.

. . . The pay zone. Only four other Montana fields have ever found oil in the controversial Amsden dolomite.

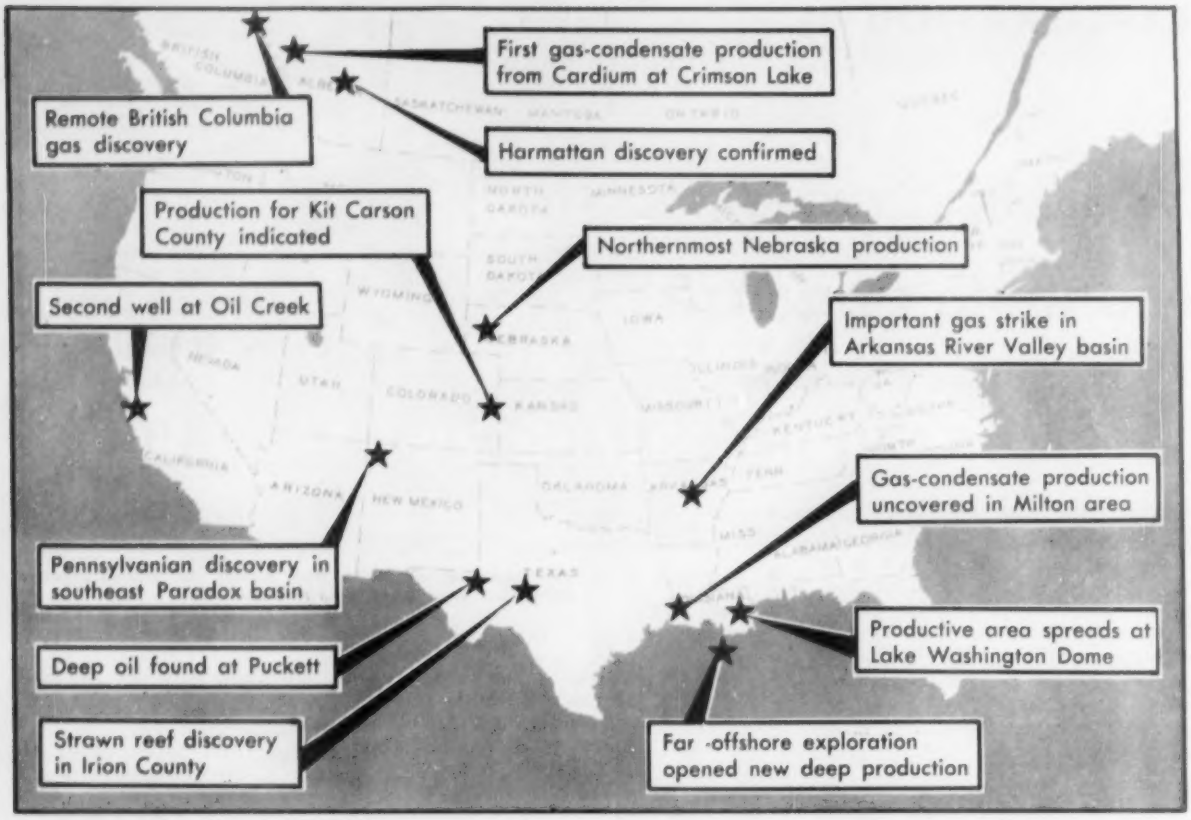
Three Amsden producers are on the Central Montana uplift . . . Gage, Big Wall, and Northwest Sumatra; the other is an old timer 75 miles south of Wolf Springs at Soap Creek. Of the four Amsden producers in Montana Sumatra was the only really important one until Wolf Springs.

Northwest Sumatra was opened in 1952 by The Texas Co., following the drilling of a seismic prospect. Later McAlester Fuel Corp. opened Amsden dolomite production at the 3 Northern Pacific on the field's edge. This discovery was followed by a second success that changed the entire development picture of the field. The field was one of the most active areas in the Rockies last year. Extensions were added to both sides of the field and production was established in three new pay zones, the Amsden, the Heath "A" sand, and the Piper lime. Oil in the Piper lime discovery well is believed to be of Amsden origin.

. . . The geology. The geological implications of the Wolf Springs discovery are of the utmost significance.

The field lies off the south flank of the Central Montana uplift (Big Snowy anticlinorium), and on the east flank of the Bull Mountain syncline. The gently dipping southern flank of the Central Montana uplift offers good possibilities of additional oil fields.

The Wolf Springs discovery was drilled in an area of little previous drilling activity. It paved the way for more drilling in the vast central Montana region, a relatively untested, complex area of high promise. The Rocky Mountain province has a wealth of such exploratory hopefuls. One by one the exploratory frontiers of the region are falling before the wildcat drill. The Wolf Springs success story is a shining reward for the exciting oil business in the Rockies.


First gas-condensate production from Cardium at Crimson Lake
Remote British Columbia gas discovery
Harmattan discovery confirmed
Production for Kit Carson County indicated
Northernmost Nebraska production
Second well at Oil Creek
Important gas strike in Arkansas River Valley basin
Gas-condensate production uncovered in Milton area
Pennsylvanian discovery in southeast Paradox basin
Productive area spreads at Lake Washington Dome
Deep oil found at Puckett
Strawn reef discovery in Irion County
Far -offshore exploration opened new deep production

March belongs to West Texas as . . .

Puckett Lights Way for Deep Oil Hunt

by John C. McCaslin

A DEEP Pennsylvanian oil discovery at Puckett gas field in the Delaware basin of West Texas overshadowed other March exploratory developments. Not to be overlooked, however, were important offshore developments in Louisiana, rank discoveries in the Denver-Julesburg and Paradox basins and Arkansas, and confirmations to important new producing areas in the San Francisco and Harmattan regions.

Delaware basin . . . Gulf Oil Corp. shook basin exploration with the biggest discovery in the region since the opening of Ellenburger gas production at Puckett field.

The 1-A Robbins gas unit uncovered the first Pennsylvanian oil pool on the large Puckett anticline in Pecos County. Location is 20 miles from the nearest oil production at Taylor-Link field, also in Pecos County. It is 30 miles southeast of the nearest Delaware basin field at Fort Stockton, a Permian producer at 2,500-3,000 ft.

This Puckett oil discovery should encourage a long-awaited deep Delaware basin campaign. The well is in the Sheffield channel, an ancient seaway that connected the Delaware and Midland basins. The only good pre-Permian production in the Delaware basin is at Toyah and Bell Lake, both gas producers. There are many shallow Permian pools in the basin, but the thick Permian section has hindered deep exploration in recent years. It is generally thought that this vast, deep basin contains deep oil pools. The basin is certainly in the future-petroleum-province category. It is one of Texas' remaining oil frontiers, and one of the most hopeful.

The Gulf well is scheduled for the Ellenburger at 15,000 ft. On the way down the well hit gas in the Devonian and blew out. The well was brought under control and near month's end cleanup operations were under way.

Far-offshore success reigns . . . Phillips Petroleum Co. completed an oil discovery in the Gulf of Mexico about 35 miles south of St. Mary Parish, South Louisiana.

The 1-A Eugene, the first test drilled in Block 129-A, Eugene Island area, flowed oil at the rate of 576 bbl. per day from perforations at 12,939-48 ft. Location is about 2 miles south of Magnolia's production in Block 129.

. . . Onshore developments. Another major extension was completed for the already widely spread Lake Washington field in the delta marsh area of Plaquemines Parish.

John W. Mecom and Associates 2 Bay Long Unit 1, off the southwest flank of the big dome, flowed at the rate of 227 bbl. per day. Location is

Total March Completions, Exploration, and Development

	Total completions					Total wildcat wells					Cable tool comp.	Active operations
	Total	Oil	Gas	Dry	Footage	Total	Oil	Gas	Dry	Footage		
Alabama	6	2	1	3	43,897	3	0	1	2	17,999	0	16
Arkansas	78	54	1	23	240,243	14	3	1	10	61,091	11	60
California	155	117	4	34	739,406	35	3	0	32	192,975	13	235
Colorado	62	8	8	46	336,422	34	0	0	34	194,968	0	89
Illinois	184	86	2	96	427,283	39	2	0	37	83,704	14	446
Indiana	52	28	0	24	78,969	9	1	0	8	13,068	39	59
Kansas	406	186	38	182	1,416,666	72	8	3	61	280,633	82	407
Kentucky	127	47	23	57	191,454	32	1	0	31	45,674	104	226
West	90	41	2	47	103,788	28	1	0	27	36,540	72	166
East	37	6	21	10	87,666	4	0	0	4	9,134	32	60
Louisiana	283	177	19	87	2,186,372	53	14	3	36	514,536	0	455
North	101	65	7	29	379,099	15	2	0	13	73,603	0	130
South	146	87	11	48	1,456,808	30	10	2	18	342,635	0	255
Offshore	36	25	1	10	350,465	8	2	1	5	98,298	0	70
Michigan	46	22	1	23	129,616	17	0	0	17	47,828	38	102
Mississippi	29	5	1	23	187,571	13	0	1	12	76,683	0	36
Missouri	15	0	0	15	12,188	15	0	0	15	12,188	15	0
Montana	24	16	1	7	152,665	5	1	0	4	32,338	4	46
Nebraska, West	54	19	0	35	300,752	28	3	0	25	152,109	0	49
New Mexico	119	69	28	22	566,083	12	2	0	10	53,974	12	173
Northwest	31	3	24	4	122,612	3	0	0	3	9,446	1	42
Southeast	88	66	4	18	443,471	9	2	0	7	44,528	11	131
New York	23	12	0	11	33,350	0	0	0	0	0	23	11
North Dakota	12	7	0	5	98,362	4	0	0	4	30,865	0	23
Ohio	91	54	11	26	230,369	0	0	0	0	0	91	209
Oklahoma	705	423	26	256	2,455,970	68	14	3	51	324,608	73	1,135
Pennsylvania	49	11	22	16	127,751	0	0	0	0	0	45	73
South Dakota	1	0	0	1	4,780	1	0	0	1	4,780	0	1
Texas	1,726	1,122	60	544	7,568,054	431	77	12	342	2,129,174	104	1,277
North (9)	342	209	0	133	1,099,390	58	5	0	53	214,944	21	136
West Central (7-B)	242	135	0	107	843,564	94	21	0	73	312,997	24	191
West (7-C & 8)	476	414	3	59	2,374,795	71	23	1	47	439,040	48	433
Panhandle (10)	101	77	13	11	371,997	9	2	0	7	72,573	0	79
East (5 & 6)	73	31	6	36	367,019	31	1	2	28	169,122	0	101
Southwest (1)	160	108	3	49	470,581	47	6	3	38	190,307	4	55
Gulf Coast (2)	70	26	8	36	416,103	26	4	1	21	137,675	0	37
Gulf Coast (3)	144	70	13	61	956,575	45	4	2	39	319,297	0	158
Southwest (4)	118	52	14	52	668,030	50	11	3	36	273,219	7	87
Utah	6	0	0	6	34,549	5	0	0	5	28,466	0	31
West Virginia	62	10	40	12	161,001	4	0	2	2	14,853	58	175
Wyoming	45	27	1	17	202,471	16	2	0	14	69,010	3	86
Total March 1956	4,360	†2,502	287	*1,571	17,926,244	910	‡131	26	753	4,381,524	728	§5,422
Total February 1956	4,615	2,533	281	1,801	18,974,714	1,030	149	31	850	4,909,483	721	5,397
Cumulative 1956	13,930	7,678	913	5,339	57,391,564	3,088	438	92	2,558	14,876,944	2,067	
Cumulative 1955	13,103	7,564	752	4,787	52,892,000	2,756	416	85	2,255	13,331,000		
Western Canada	255	158	14	83	1,294,921	86	9	8	69	441,943		
Alberta	180	113	12	55	993,208	56	4	6	46	307,730		
Saskatchewan	51	33	0	18	219,291	19	5	0	14	79,922		
Manitoba	18	12	0	6	42,730	5	0	0	5	14,599		
British Columbia	6	0	2	4	39,692	6	0	2	4	39,692		
Cumulative 1956	665	480	27	158	3,283,042	173	28	17	128	884,249		

*Incl. 86 service wells: Kans. 5, N. Y. 11, Ohio 3, Okla. 54, Pa. 8, N. Tex. 4, E. Tex. 1. †Incl. 40 dist. wells: S. La. 11, La. offshore 2, Miss. 1, Okla. 14, W. Tex. 1, Tex. Panhandle 2, Tex. Dist. (1) 1, Tex. Dist. (2) 2, Tex. Dist. (4) 6. ‡Incl. 13 dist. discoveries: S. La. 4, La. offshore 1, Okla. 1, Texas Panhandle 2, E. Tex. 1, Tex. Dist. (1) 1, Tex. Dist. (2) 1, Tex. Dist. (4) 2. §Incl. Ga. 2.

10 miles southwest, and on the opposite side of Lake Washington dome, from the world's deepest hole.

The Milton area, 10 miles north of Abbeville in northeastern Vermilion Parish, was opened to gas-condensate production at Seaboard Oil Co. 1 Hebert, Jr. The discovery flowed at the rate of 4,235 M.c.f. of gas and 96 bbl. of condensate per day from the Frio sand at 11,380-82 and 11,388-92 ft. Nearest production is Ridge in Lafayette Parish, 5 miles northwest, also a Frio producer.

Paradox begins its payoff . . . The second important discovery in the Paradox basin for 1956 was made at Humble Oil & Refining Co.'s 1-B Navajo, a San Juan County wildcat in New Mexico.

This Hermosa - Pennsylvanian well flowed oil at the rate of more than 20 bbl. per hour on test at 5,539-5,606 ft. The well is 25 miles southeast of The Texas Co.'s Paradox discovery at 1 Navajo, San Juan County, Utah. That big strike flowed at the rate of 1,700 bbl. per day. The new discovery at Humble's wildcat is on the southeast edge of the basin. The two discoveries are the biggest exploratory events in this region since the Desert Creek field was opened in November 1954.

The D-J stretch . . . Shell Oil Co. moved Denver-Julesburg production on the Nebraska side of the fence to its northernmost point in that state.

The 1 Horn, northern Banner County, recovered 2,230 ft. of oil on one test of the Dakota "J" sand. This new discovery is 8 miles north of Olsen

Total Depth Classifications, March 1956

	A 0-1,250 ft.	B 1,250-2,500 ft.	C 2,500-3,750 ft.	D 3,750-5,000 ft.	E 5,000-7,500 ft.	F 7,500-10,000 ft.	G 10,000-12,500 ft.	H 12,500-15,000 ft.	I Over 15,000 ft.
Alabama	0	0	1	1	2	0	2	0	0
Arkansas	0	32	22	17	7	0	0	0	0
California	12	31	31	26	25	16	10	4	0
Colorado	0	0	4	14	43	1	0	0	0
Illinois	25	70	87	2	0	0	0	0	0
Indiana	25	23	4	0	0	0	0	0	0
Kansas	7	52	190	140	17	0	0	0	0
Kentucky	67	40	15	5	0	0	0	0	0
West	62	24	4	0	0	0	0	0	0
East	5	16	11	5	0	0	0	0	0
Louisiana	2	49	23	11	37	65	57	31	8
North	1	47	22	3	16	9	3	0	0
South	1	2	1	7	15	39	49	27	5
Offshore	0	0	0	1	6	17	5	4	3
Michigan	0	22	12	10	2	0	0	0	0
Mississippi	0	1	0	6	14	5	3	0	0
Missouri	13	1	1	0	0	0	0	0	0
Montana	0	5	3	0	5	10	1	0	0
Nebraska, West	0	0	5	13	36	0	0	0	0
New Mexico	10	14	31	28	14	6	8	8	0
Northwest	2	10	5	2	10	2	0	0	0
Southeast	8	4	26	26	4	4	8	8	0
New York	0	23	0	0	0	0	0	0	0
North Dakota	0	0	0	0	3	8	0	1	0
Ohio	16	12	59	4	0	0	0	0	0
Oklahoma	91	192	178	88	61	83	8	3	1
Pennsylvania	1	30	13	0	4	1	0	0	0
South Dakota	0	0	0	1	0	0	0	0	0
Texas	123	332	368	365	341	151	38	8	0
North (9)	46	114	39	74	61	7	1	0	0
West Central (7-B)	14	86	40	56	46	0	0	0	0
West (7-C & 8)	6	54	140	123	96	37	14	6	0
Panhandle (10)	0	5	80	3	3	9	1	0	0
East (5 & 6)	8	14	6	17	28	0	0	0	0
Southwest (1)	39	33	33	37	14	2	2	0	0
Gulf Coast (2)	0	3	9	16	20	22	0	0	0
Gulf Coast (3)	9	12	8	15	35	47	17	1	0
Southwest (4)	1	11	13	24	38	27	3	1	0
Utah	1	1	0	0	3	0	0	1	0
West Virginia	2	35	10	13	2	0	0	0	0
Wyoming	10	4	6	9	10	3	2	0	1
Total March 1956	405	969	1,063	753	626	349	129	56	10
Total February 1956	434	1,052	1,069	729	740	362	146	78	5
Cumulative 1956	1,336	3,157	3,320	2,216	2,108	1,122	444	202	25
Western Canada	3	20	28	68	110	22	3	1	0
Alberta	1	3	17	32	104	20	2	1	0
Saskatchewan	1	3	8	34	5	0	0	0	0
Manitoba	1	14	2	1	0	0	0	0	0
British Columbia	0	0	1	1	1	2	1	0	0
Cumulative 1956	3	60	71	183	297	47	3	1	0

field and 10 miles northeast of Harrisburg.

Down in eastern Colorado there were indications of production for Kit Carson County. Harry Royster and New Drilling Co. recovered 12 bbl. of oil per day on test of the Lansing-Kansas City (Pennsylvanian) at the 1 Reitman. Location is near the Las Animas arch, just inside the basin. The only other pre-Cretaceous production in the region is in Weld County.

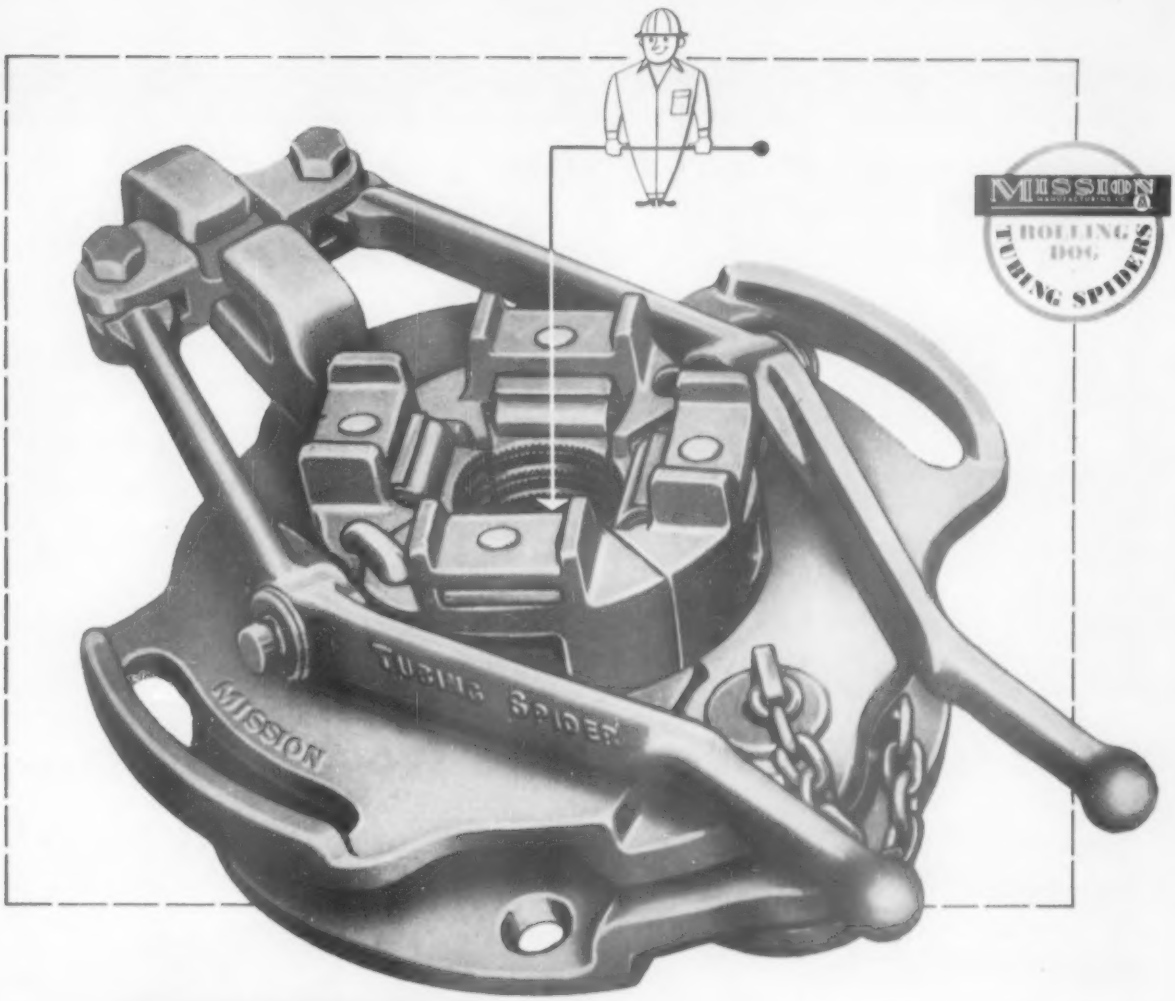
Arkansas Valley awakens . . . One of the most newsworthy discoveries in some time for the long McAlester-Arkansas Valley basin was made in Conway County, near the town of Jerusalem, Arkansas.

Carter Oil Co. 1 Morrilton Lumber Co., 11 miles northeast of Moreland field, flowed 5,205 M.c.f. of gas per day from 15 ft. of pay in the Atoka-Pennsylvanian sand at 1,938-62 ft. This is the easternmost producing area in the old gas-producing basin. On the Oklahoma end of the basin a Hunton lime gas producer was completed, opening a new area in McIntosh County.

Oil Creek looks better . . . Union Oil Co. completed the first offset to its Oil Creek discovery in the rugged Santa Cruz Mountains of southern San Mateo County, Bay area, California. The 2 Costa pumped 30 bbl. of oil per day from 1,915-2,000 ft. This interesting and nearly inaccessible producing area was opened last year.

The Cardium story . . . The first gas-condensate production from the Cardium sand in the foothills belt of Alberta was a March exploratory story. Great Plains' Crimson Lake discovery, 12 miles northwest of the town of Rocky Mountain House, flowed 5,200 M.c.f. of gas per day on drill-stem test. Distillate was also recovered. Location is 12½ miles southwest of Rocky Mountain House field, another Cardium area.

. . . Harmattan. The Harmattan discovery area, a Mississippian exploratory success of 1955, was confirmed in March. Home Oil Co., Ltd., completed the important confirmation well for about 600 bbl. per day. Harmattan promises to be another prolific link in the Sundre-Westward Ho Mississippian discovery chain.



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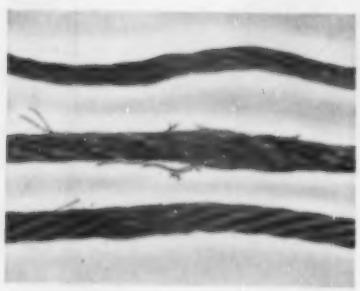
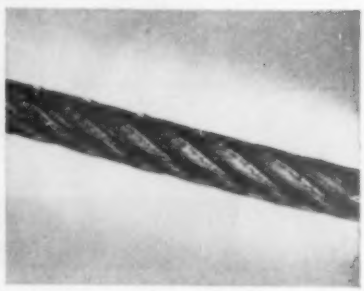
Tuffy® Tips

This Is Often Where The Trouble Starts...



Here are three types of open kinks, all resulting from mishandling of wire rope. Guard against kinks by winding rope properly on the drum, and *never* pull a loop smaller, always enlarge it then straighten out the rope.

The start and finish of doglegs; the end being the point when all the wires on one side of the rope were worn through. Anything, such as a pulled loop, that causes a permanent bend or "set" will result in a dogleg.



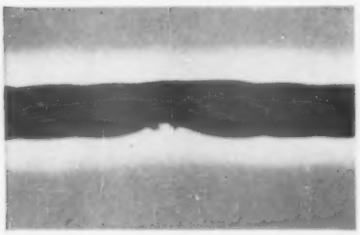
While different wire rope is constructed to resist abrasion to different degrees, improper use leads to injury. Watch for abrasion and when it begins to show locate the point where it is occurring and correct the cause.

Severe corrosive water conditions caused rust and corrosion to produce a one-strand break in this rope. Lubrication during the time the rope was in service would have retarded the damage . . . added greatly to the rope's life.

If broken in improperly, high strands like these may result. When installing, make sure that the fabricated relation between *strand with strand* and *strands with core* are not changed.

Nailing a wire rope through the core often causes many undesirable results. The wires and the core are badly damaged. A high strand may develop near the end or many feet away.

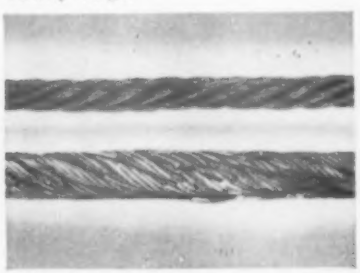
Broken Rules Break More WIRE ROPE Than Capacity Loads



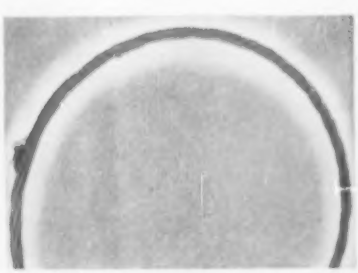
The photo at the left shows what happens when rope is run over or struck by a hard object and crushed. The damage to the strands greatly reduces the service life so carefully built into the rope.

Photo at the right shows how sudden release and rebound from an over-stressed condition may often cause birdcaging. Throwing a loop into the rope is also a major cause of birdcaging. Lang Lay ropes in particular are vulnerable to this abuse.

Here is an example of excessive pinching in the sheave grooves. This rope lasted through only 1-½ hours of service. To prevent pinching, make sure grooves are not worn deep and that the bearing surface is sufficiently large.



Excessive drum crushing like this occurs at points of cross-over or when rope is wound unevenly. Check for even winding of each layer on the drum to prevent crushing of this type.



When a popped core occurs, continued use causes the rope lay to lengthen out considerably. This displacement of the core is usually caused by load tension being suddenly removed from the rope.

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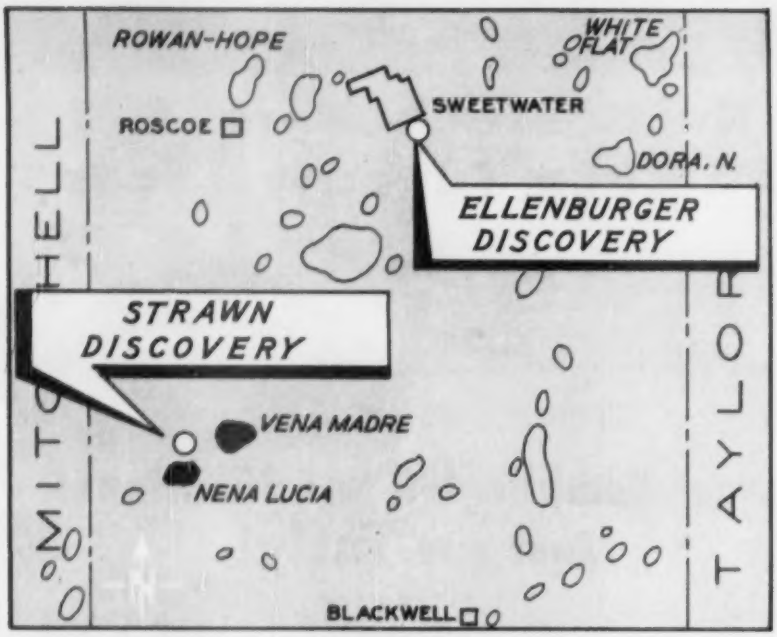

Hot spots in Nolan County, West Central Texas. Sinclair opened Ellenburger production on outskirts of Sweetwater, and the Nena Lucia-Vena Madre areas got a discovery or long extension.

Nolan County Active . . .

Three pays at Nena Lucia, new oil at Sweetwater, spurs drillers

by Carl Hoot

NOLAN County, situated along the eastern shelf of the Midland basin in West Texas, currently holds the spotlight for its area. Recent developments include an Ellenburger discovery by Sinclair Oil & Gas Co. on the outskirts of the city of Sweetwater.

First commercial production in Nolan County was in 1939, but there was little drilling until 1946. Drilling in the county took on new life with the discovery of many Strawn reef-like pools in the early 50's. Discovery of a thick, heavily saturated Cambrian sand at White Lake field in 1953 gave the county's oil finders an entirely new outlook, and many new pools were opened along the eastern border of Nolan County.

A paper presented before the West Central Texas Oil and Gas Association at Abilene, in 1952, mapped a prominent subsurface structural ridge running approximately north-south through the eastern half of the county, and on into southern Fisher County.

Initial oil search in the county followed this underground structure. Discoveries flanking this ridge include Blackwell, at the extreme southern end of the county, northward through Blackwell, North, Hylton, Maryneal, E. A.-Cambrian, North Dora and on into White Flat field.

A Strawn or lower Pennsylvanian trough probably parallels the subsurface high ridge to the east. Lying to the west of this Strawn trough is a minor Ellenburger or lower Strawn high area located in the west-central portion of the county.

Drilling since this paper was presented in 1952 has borne out many of these speculations. When drilling slowed on the county's eastern side, exploratory work started through the central and southwestern areas, and many new pools were opened.

One of these new pools, and currently the most active with 5 wells drilling and 20 locations showing is the Nena Lucia field. The field produces from the Strawn and Odom limes, and Ellenburger pay was opened last week at Honolulu Oil Corp. 3 Spires. Potential test in the Ellenburger had not been run at this writing, but the well had flowed 20 bbl. of Ellenburger oil an hour on 7/16-in. choke, and from the Strawn had made daily potential of 673 bbl. a day on ¾-in. choke.

Sun Oil Co. has stepped up its drilling program at Nena Lucia, with four rigs running and two additional expected to be brought into the area. Last week Sun announced 16 new locations, on Virginia Baker and M. L. Compton acreage.

Sweetwater discovery . . . Sinclair 1 Kate C. McAdams, located on the southeastern edge of Sweetwater, in 60-22-T&P Survey, finished last week for a flowing potential of 304 bbl. of 47 bbl. a day.

Production was through 20/64-in. choke, from Ellenburger perforations at 6,484-96 ft. Gas-oil ratio was 290:1 and flowing tubing pressure was 70 psi. Top of the Ellenburger was 6,443 ft., on ground elevation of 2,170 ft.

Sinclair holds considerable acreage around its discovery, but other owners include Phillips Petroleum, Atlantic Refining Co., Rowan & Hope, and Gulf.

As in most wells in Nolan County, operators have more than one prospective oil zone to shoot for. Sinclair's discovery indicated possible production from the Caddo and Mississippian, and logged oil shows from two sections of Canyon sand.

Vena Madre field . . . This area, also a recent development in southwestern Nolan County, is generally expected to merge with Nena Lucia field. Drilling has slowed at Vena Madre, but reports still show from three to four rigs running.

Magnolia Pipe Line Co. is working on a new gathering system to serve the Vena Madre-Nena Lucia area, with oil to be run to its main line at Sweetwater.

Dry hole discovery . . . Graves & Bradley, former dry hole north of Nena Lucia and west of Vena Madre, has been completed as a Strawn discovery and may serve as the connecting link between the two areas.

Initial potential was 241 bbl. of oil a day through 16/64-in. choke, from perforations at 6,934-68 ft. Electrical log shows top of the Strawn reef at 6,895 ft., with elevation of 2,483 ft. The well was previously drilled to the Cambrian and completed dry at 7,850 ft.

Reference

Nolan County, Texas, Offers Promising Prospects, by B. F. Hoffacker, Jr., The Oil and Gas Journal, February 9, 1953.

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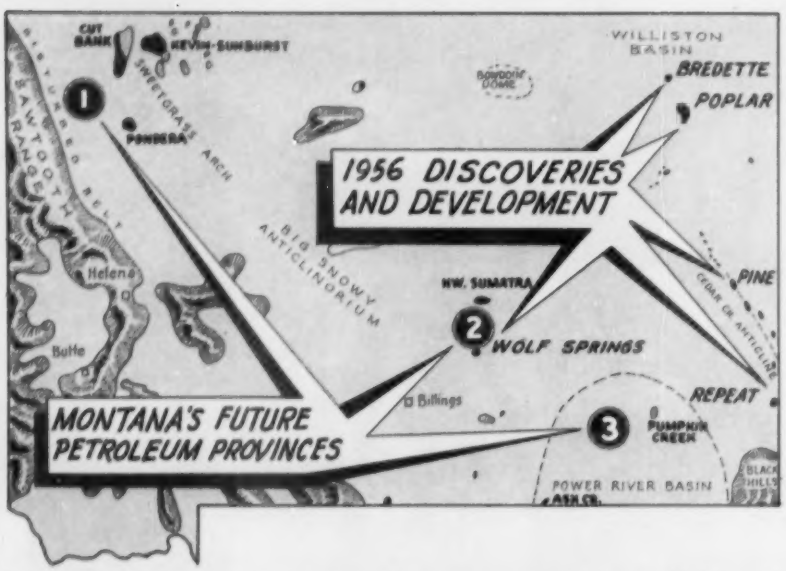


First-quarter discoveries and field development in Montana point to a year of highly significant drilling on a state-wide basis. Four areas share the exploratory spotlight: Wolf Springs, Repeat, Bredette, and East Poplar.

Montana Discovers, Develops And Looks to the Future

by John C. McCaslin

MUCH of the exploration story in the Rocky Mountain province this year is being written on the central and eastern Montana plains. The brightest spot on the Montana exploratory scene is the Central Plains where the most significant development since Poplar field is taking place at Wolf Springs. The Williston basin portion of the state has taken on new life with a new-pay discovery at Poplar, successful expansion of the Bredette-Mississippian reservoir, additional Silurian wells at Pine Unit, and a Red River-Ordovician success in the far southwestern corner of the basin.

There are indications that additional oil hunting is on the agenda for three of Montana's future petroleum province candidates in the coming months. Despite last year's disappointments in the Disturbed Belt interest is still high in the prospects of finding oil in the vast region between the Sweetgrass arch and the Rocky Mountain front in northeastern Montana. The Bull Mountain basin between Wolf Springs and the Sumatra fields on the Montana Plains is high on the list of potential discovery areas. Another very attractive target for the drill is the northern portion of the Powder River basin in southeastern Montana. Two important producing areas have been opened in this sparsely tested region in recent years, Ash Creek and Pumpkin Creek. It is thought that similar stratigraphic traps might produce throughout this part of the basin.

The most significant development story in Montana since Poplar field is being written on the Central Plains at Wolf Springs (see page 177). Five wells are on production in this Amsden dolomite reservoir with new locations being announced weekly. The success at Wolf Springs heralds a new era for exploration on the Central Montana uplift. The only real success from Amsden dolomite has been at Northwest Sumatra.

Williston Basin

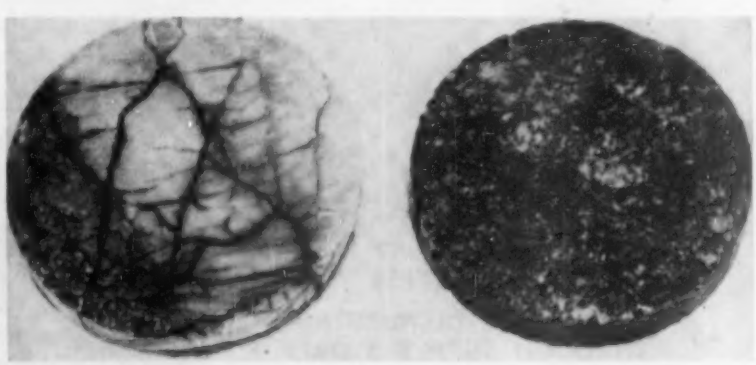
The Montana portion of the Williston basin is enjoying much better success this year in exploration and development than its eastern neighbor, North Dakota. New discoveries, new-pay strikes, and extensions to older fields promise that 1956 wildcat laurels may go to Montana.

Repeat . . . The most important new-field discovery in the basin and in Montana this year is the Ohio Oil Co.-Texas Pacific Coal & Oil Co. Repeat area Ordovician strike in Carter County in the southeastern corner of the state.

This Red River well was completed in March for 186 bbl. of oil per day on 10/64-in. choke from perforations at 8,605-10 ft. The 1 Government in C Lot 6, 4-1s-62e, lies 22 miles west of production at South Dakota's Buffalo-Red River field, and 19 miles southeast of nearest Montana production at Little Beaver field on the south end of the long Cedar Creek anticline. The Repeat discovery opened an entire new area for exploratory consideration off the southwest flank of the Cedar Creek structure. A confirmation test 1 mile east of the discovery well is in the Ordovician at this writing.

Bredette . . . An early 1955 Mississippian discovery in northeastern Montana's Roosevelt County is developing into a highly regarded producing area for the Williston basin.

The California Co. began the 1956 development at Bredette with completion of the 1 Rasmusen in C NE NW 13-32n-49e as a MacGowan (Madi-



Amsden dolomite core. DeKalb Agricultural Association, Inc.-Northern Oil Division 1 State, 24-7n-31e, Yellowstone County, Montana. Depth 6,200 ft. IP 785 BOPD, ¾-in. choke. (Photo courtesy Northwest Geological Service, Billings). See Exploration Highlight page 177.

CASE HISTORY N°AU-WA-3122

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In search of oil at GRANT RANGE N°1

OWNERS: West Australian Petroleum Pty. Ltd.
OPERATORS: Loffland Bros. Co., Tulsa, Oklahoma.
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PERFORMANCE: Engines into service October 31, 1954 when first well drilled was spudded in. When the well was abandoned at depth 12,915 ft., October 23, 1955 the three engines had run average of 7,845 hours each. They operated very satisfactorily and showed no wear.

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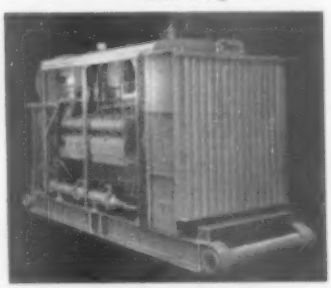

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son) well. This was the third well completion for the field, two having been finaled last year. In March Earl Cranston recovered 1,240 bbl. of oil in 24 hours at 1 Rasmusen in C NW NW 13-32n-49e on ¼-in. choke to bring in the field's fourth producer. Later the well flowed 343 bbl. of oil in 21½ hours on ⅛-in. choke from MacGowan zone perforations at 6,486-6,510 ft. This well was the highest, structurally, drilled to date in the field.

Pine unit . . . This Cedar Creek anticline field has been active this year after a period of quiet.

Shell Oil Co. recently completed its 24-2B in SE SW 2-12n-56e, Prairie County, for an initial pump gage of 243 bbl. per day from Stony Mountain-Ordovician at 8,368-8,916 ft. and Red River at 9,034-72 ft. This new producer is 3½ miles northeast of nearest field production, and is considered a separate reservoir as two dry holes have been put down in the intervening area.

. . . Silurian development. Shell reported in February recovery of 67 bbl. of oil per hour on test of the Silurian at the 43-23A well in C NE SE 23-11n-57e, Pine Unit. Silurian production was established in the field after its discovery 4 years ago. There are 13 such wells on production at Pine Unit. The distinguishing factor about the new Shell Silurian strike is that the formation is thicker and higher structurally in this portion of the field. The well also had very good porosity in the Silurian formation.

New-pay discovery for Williston . . . Murphy Corp. established a new pay sand for the Williston basin at its 63 Unit in East Poplar, Roosevelt County, 1¾ miles southwest of previous production in the field.

The well flowed 63 bbl. of oil per day from the Kibbey sand at 5,231-43 ft. on 12/64-in. choke. The Kibbey sand has had no previous shows in Williston basin exploration, but it does produce at Ragged Point field on the Montana Plains. The Kibbey, which is the lower member of the Mississippian Big Snowy group, is found in eastern and central Montana, northwestern South Dakota, and western North Dakota. It generally has poor reservoir characteristics.

EXPLORATION HIGHLIGHTS

GULF COAST

SOUTH LOUISIANA

Little Lake-Lafitte Gap Gets New Oil Discovery

Richardson & Bass are opening a new, deep oil-productive area between Little Lake and Lafitte fields, 25 miles south of New Orleans, in Jefferson Parish. Discovery well, 1 State Lease 2372, is about 2 miles east of production at Little Lake, and 4½ miles southwest of Lafitte.

The well, with pay at 12,475-84 ft., is rated good for 147 bbl. of 28.2°-gravity oil per day through 7/64-in.

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choke with pressure of 3,525 psi. It was drilled to 12,605 ft.

Little Lake field, nearest production, was discovered by Gulf Refining Co. in May 1948. It now has more than 40 wells with production from 8 zones from 9,390 ft. to 11,750 ft.

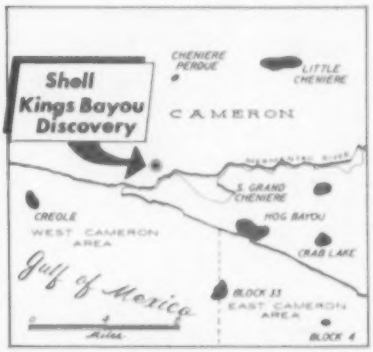
Deep Discovery Extends First Far-Offshore Field

Production at Ship Shoal Block 32 dome, 9 miles off the Terrebonne parish coast, in the Gulf of Mexico, has been extended to the north flank, in Block 30, with a deep gas-condensate discovery by Kerr-McGee Oil Industries, Inc., joint opjerator with Phillips Petroleum Co. and Stanolind Oil & Gas Co.

Discovery is in the joint operators' 1-G State Lease 725 (2 OCS-0333), which flowed at the rate 3,390,000 cu. ft. of gas per day in tests through 13/64-in. choke. Gas sprayed distillate. Pressure was 3,500 psi.

First production on the dome was opened in November 1947 with pay in a 1,700-ft. Pliocene sand. Seven additional sands have been found productive on or around flanks of the dome.

Except for Creole field, located close to shore, in Cameron Parish, Ship Shoal Block 32 was the first field opened in open waters of the Gulf of Mexico.



Location of Shell Oil Co.'s new gas-condensate discovery well in the Kings Bayou area, southern Cameron Parish, Louisiana.

Shell Discovery Uncovers New Cameron Parish Field

Shell Oil Co. has a new gas-condensate discovery in coastal Cameron Parish, where more than a half dozen new deep fields have been opened within the past year.

Its discovery well, 1 James M. Meaux, in the Kings Bayou area, 5 miles northwest of Hog Bayou field, is rated good for 74 bbl. of 43°-gravity condensate and 3,057,000 cu. ft. of gas per day through 9/64-in. choke. Flow was under pressure of 6,400 psi.

Production is from Miocene sand perforations at 12,911-24 ft. Hole is bottomed at 13,500 ft., and is cased to 13,024 ft.

Drilling already is getting under way at Shell's first confirmation attempt, 1 John H. Meaux, east offset to the discovery.

The area, 2 miles inland, is a little more than 5 miles northeast of Creole field, a mile from shore and Louisiana's first field in open waters of the Gulf of Mexico.

Lapeyrouse Outpost Well Opens Deeper Pay Zone

Placid Oil Co. is giving the Lapeyrouse area, in Terrebonne Parish, its sixth producer, its fourth pay zone, and a major extension with the completion of a 15,000-ft. well 1½ miles south of the field.

The well, 2-B LL&E, produced at the rate of 3,000,000 cu. ft. of gas per day, making 82 bbl. of condensate and 26 bbl. of water. Flow was under pressure of 6,950 psi. Pay zone, deepest

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BY YEARS OF DEPENDABLE PERFORMANCE

in the area, is perforated at 15,025-35 ft. Total depth is 15,038 ft.

Gulf Refining Co. opened the field in October 1941 with gas-condensate production from perforations at 10,883-94 ft. Gulf's second test, northwest of its discovery well, was dry. Since, British-American Oil Producing Co. has completed a well with pay at 12,640 ft.; and Placid Oil Co. Four wells (including the new producer), one at 12,480 ft., its second at 13,692 ft., and its third at 12,767 ft. and (workover) 10,634 ft.

The area is 18 miles southeast of Houma.

SOUTHWEST TEXAS

Two-Zone Oil Discovery Extends Jim Hogg Field

W. L. Cotton and Blair-Vreeland have a new oil-discovery in the Yeager area, 6 miles southwest of Hebbronville, in northwestern Jim Hogg County. Their discovery well, 1 R. R. Yeager, a mile from production, is being completed dually in Loma Novia "A" and Pettus sands.

The well was drilled at 3,606 ft. and has casing on bottom. An open-hole drill-stem test at 3,142½-50 ft., in the Loma Novia "A" sand, recovered 215 ft. of pipline oil and 15 ft. of oil-cut mud. Recovery was through ¼-in. chokes with tester open 30 minutes.

A Pettus-sand test at 3,600-06 ft. got 1,700 ft. of pipeline oil and 20 ft. of oil-cut mud with bottom-hole of 335 psi., flowing, and 1,315 psi., shut in.

Farther southwest, in the Stroman area, the same operators are extending production 1,500 ft. with a new Pettus well, their 3 Stroman. It is being completed on the pump after swabbing 80 bbl. of 36°-gravity oil per day. Pay is perforated at 3,630-34 ft.

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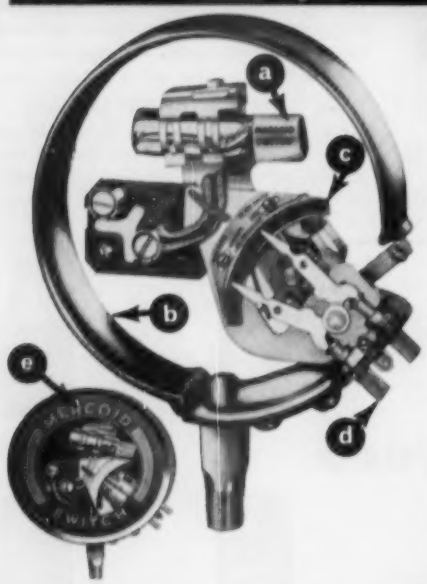

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EASTERN INTERIOR

ILLINOIS

Eight Extensions to Oil and Gas Pools in March

No new oil or gas pool was discovered in Illinois in March, but eight extensions were completed. The eight extensions include four to Cooks Mills Consolidated, three in Coles County, and one in Douglas County; the other four extensions are to Herald Consolidated in Gallatin County, Olney South in Richland County, Goldengate Consolidated in White County, and the Fishhook gas pool in Pike County.

The first successful Trenton limestone well in the Patoka pool in Marion County was completed in March, and the second Trenton well in the Irvington pool in Washington County; the Trenton was a new pay in Irvington in February.

Drilling is still slowed down by poor road conditions. Completions for March totalled 237 wells in a 5-week period. This brings the total for the first three months to 743, or 33 wells less than for the same period in 1955, the second highest year in Illinois drilling history. At present, this slow-down in drilling appears to be entirely seasonal.

Production for March is estimated at 7,212,000 bbl., or about 233,000 bbl. daily. This production rate has shown only minor variations during the past few months.

The Cooks Mills Consolidated area in Coles and Douglas counties is the most active single area in the state. Twelve new oil wells were completed in March, four of which extended the producing area. Three oil and two gas pays have been found. Widespread wildcat drilling in Coles and Douglas counties is evidence that oil men hope to find other similar pools.

Interest also remains high in the

Harco area in Saline County, where five good wells were completed in March. This production is from the Aux Vases sandstone. Fourteen wells were drilling at the end of the month.

ARK-LA-TEX

ARKANSAS

March Discoveries

Exploration in Arkansas during the month of March netted one important new gas field, one new oil field, and two new oil pays in older producing areas.

Jerusalem . . . At the east end of the long McAlester-Arkansas River Valley basin Carter Oil Co. opened dry gas production near Jerusalem in Conway County.

The 1 Morrilton Lumber Co., C NW SE SW 33-9n-17w, 11 miles northeast of nearest production at Moreland field, Pope County, had a draw-down potential of 5,205 M.c.f. per day from the Atoka perforations at 1,938-62 ft.

New oil pool . . . C. G. Davis opened a new Tuscaloosa oil-producing area 1¼ miles north of North Lewisville field in Lafayette County, southwestern Arkansas.

The 1 Robinson, E½ NW SW 28-15s-24w, pumped 24 bbl. of 26°-gravity oil per day from perforations at 2,671-73 ft.

New pays . . . Carter Oil Co. opened a new oil pay at 1 Golden et al in C SE SW SW 36-16s-27w, Miller County. The well pumped 102 bbl. of 23°-gravity oil per day from Glen Rose perforations at 4,522-30 ft. This new discovery is in a graben area north of main production in Fouke field.

. . . Snow Hill. Don H. Peaker et al 1 Reynolds Bros., SE SW NW 27-15s-15w, is a new lower Cotton Valley oil discovery for the Snow Hill area of Smackover field, southern Ouachita County. The well pumped 116 bbl. of 39°-gravity oil daily from perforations at 4,602-13 ft.

NORTH LOUISIANA

March Exploratory Success Featured by New Pay Hits

Two new oil pay zones were opened in North Louisiana in March. One was in Redland field, Bossier Parish; the other in Caddo Parish's Bethany-Longstreet field.

Sunray Mid-Continent Oil Co. 3 Roberson became the first Tokio oil well in Bossier Parish's Redland field. Location of the discovery is 28-23n-12w. It finaled for 55 bbl. of oil per day on pump. Perforations in the Tokio were at 2,953-57 ft. Redland field previously produced from Travis Peak, Pettet, and Buckrange.

Caddo Has New Paluxy Discovery Area

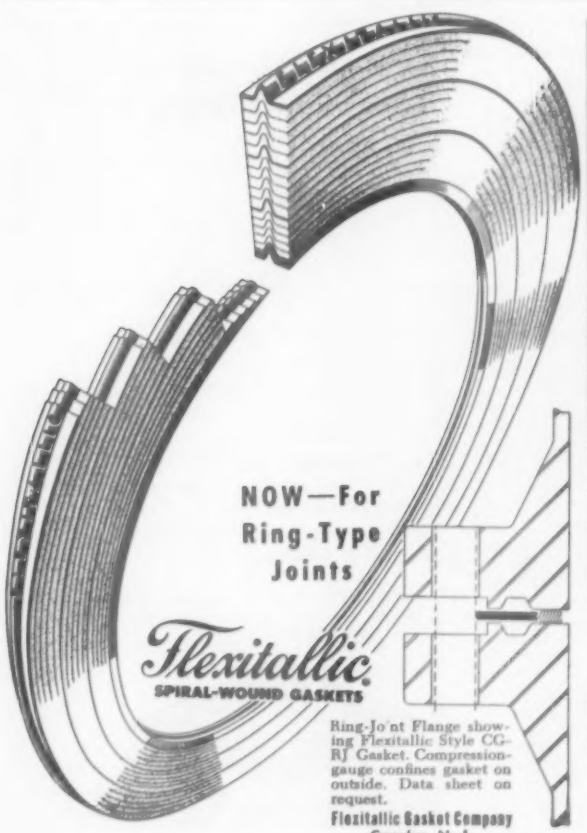
The Bethany-Longstreet field area of Caddo Parish has a new Paluxy sand oil area. Jones-O'Brien, Inc., 2 Keatchie Investment Corp. flowed 133 bbl. of oil per day from perforations at 3,066-69 ft. in the Paluxy. Location of the new pay area is 11-14n-16w.

PACIFIC COAST

CALIFORNIA

Wadley Gets Ninth Callendar Zone Well at Dominguez

J. W. Wadley completed 2 Mattoon-Kent for what is probably the first ninth Callender zone producer in Do-



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minguez field in Los Angeles Basin. This 8,450-ft. test is located on the north edge of the old field. It was brought in flowing 520 bbl. daily of 31°-gravity crude through a 40/64-in. choke. The perforated interval includes both the eighth and ninth Callender zones between 7,575 and 8,450 ft. The top of the eighth Callender was found at 7,575 ft. and the top of what is believed to be the ninth Callender at 8,100 ft. There is a possibilyity the ninth Callender is actually a lower part of the shallower pay.

The operator abandoned 1 Culbertson-Strickland, 1½ miles southwest of the main producing area. This test was taken to 14,381 ft. on the deepest penetration of six redrills. On its last test, the well had a net rise of 6,635 ft. of scum oil on a 5½-hour test at 10,685-95 ft. On another formation test at 6,500 ft. the well recovered 2,215 ft. of mud with scum and muddy water.

Standard also gave up on the 15,204-ft. 2-1 C. W. West, 1½ miles north of the producing area.

Signal Bottoms Redondo Test

Signal Oil & Gas Co. was running 6⅝-in. casing in 1 Redondo Beach, the first test of Redondo Beach's city-owned tidelands.

Signal, acting as operator for itself and two other companies, had three encouraging drill-stem tests at shallow depths en route to the bottom at 4,030 ft. The well has been plugged back to 3,100 ft. for a completion try.

Shell Extends Vedder

Shell Oil Co. stepped out Vedder zone production another ¼ mile west of the Vedder discovery well in the Posuncula area of Strand field, Kern County. Shell completed the 12,505-ft. 134-1 Posuncula-KCL flowing 614 bbl. daily of 33°-gravity crude through a 20/64-in. choke. The producing Vedder interval is between 12,468-98 ft.

HUGOTON EMBAYMENT

NORTHWEST OKLAHOMA

Important Oil Flow Reported at Laverne

Gulf Oil Corp. 1 McClung, SE SE NW 23-26n-25w, Harper County, flowed oil at the rate of 12 bbl. hourly on drill-stem test of the Morrow sand at 6,927-7,002 ft. This well is the latest addition to the growing gas-distillate reservoir in the Laverne district.

Location of the Morrow oil prospect is southwest of Magnolia Petroleum Co.'s recent Morrow sand and Tonkawa dual-zone gas-distillate discovery at 1 Stinson, NE SW 12-26n-25w. That important discovery, one of the best in northwestern Oklahoma in some time, flowed 12,000 M.c.f. of gas and 144 bbl. distillate per day from the Morrow sand at 6,908-86 ft. and 22,000 M.c.f. of gas and 9 bbl. distillate per million from the Tonkawa sand at

Hugoton embayment exploratory interest is making a definite shift to Harper County, just east of the Oklahoma Panhandle counties.

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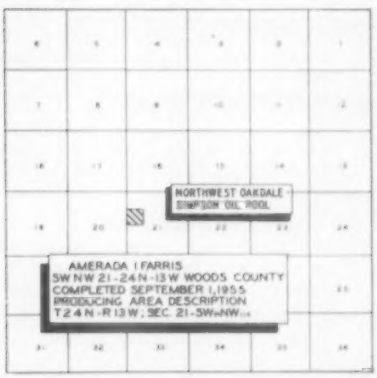
5,540-58 ft. An extensive development program is planned for the area on 640-acre spacing.

Just west of the 1 Stinson discovery, Cities Service Oil Co. has indicated Hoover sand success at the 1 McClung-A, NW NW SE 11-26n-25w, west offset to the Magnolia discovery. The well flowed 3,310 M.c.f. of gas per day and distillate at the end of 5 minutes; it flowed 4,640 M.c.f. in 10 minutes, and 5,300 M.c.f. at the end of a 15-minute drill-stem test of the Hoover sand, a Pennsylvanian zone, at 4,181-4,230 ft. Recovery on the test was 95 ft. of gas and distillate-cut mud.

About 7 miles west of the Laverne activity another important northwestern Oklahoma wildcat is establishing more Hoover sand production for the district. Sunray Mid-Continent Oil Co. 1 Barby, C SE SE 12-26n-26w, flowed 1,000 M.c.f. of gas per day on test of perforations at 4,225-48 ft.



Producing area description of Northwest Oakdale-Simpson oil pool, Woods County, Oklahoma. This well was one of the exploratory highlights of 1955 in the state.

APPALACHIAN

OHIO

Scott Oil Co. completed a gasser to extend Layland pool ¾ mile to the northwest. On 1 Clifford Hoxworth, Section 20, Killbuck Township, Holmes County, the Clinton was logged at 3,140-80 ft. with 225,000 cu. ft. natural and 2,800,000 cu. ft. after frac.

● The farthest east well in the Cottage Hill pool was brought in by Hartley & Grumbell on 1 S. L. Francis, Section 4, Hopewell Township, Muskingum County. Clinton at 3,326-72 ft. filled up 500 ft. natural and gaged 200 bbl. in a 24-hour test after frac.

● Natol 1 (2) W. E. McDonald, Section 19, Fallsbury Township, Licking County, an extension to Fallsburg pool, gaged 120 bbl. in an 18-hour test after treating Clinton, found at 3,011-65 ft.

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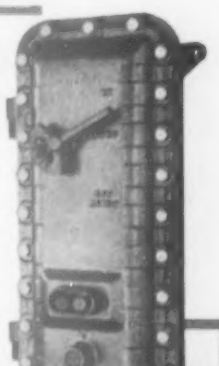

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ALBERTA

Canadian Northern Pacific 6A Pouce Coupe, LSD 10, 6-78-12w6. Cadomin gas well. TD 5,917 ft.

Gulf 11 Lanaway, LSD 11, 36-35-4w5. D3 gas well. TD 10,006.

SOUTH LOUISIANA

Cameron Parish: Shell Oil Co. 1 Meaux, 3-15s-7w. IP 74 BCPD and 3,057 M.c.f. daily, 9/64-in., 43°, perforations 12,911-24 ft. TD 13,500 ft. (New field).

Plaquemines Parish: Stanolind Oil & Gas Co. 1 Buras Levee District, 14-21s-28e. Shut-in gas well, ungaged, perforations 14,-508-518 ft. TD 15,408 ft. (New field—West Bastain Bay).

Vermilion Parish: Seaboard Oil Co. 1 Hebert, 41-11s-4e. IP 102 BCPD and 5,350 M.c.f. daily, 7/32-in., 47°, perforations 11,380-82 ft. and 11,388-94 ft. TD 13,-731 ft. (New field—Maurice).

SASKATCHEWAN

Imperial 5-8 Alameda, LSD 5, 8-4-3w2. Indicated Mississippian oil well. TD 4,600 ft.

4-9 Edevale, LSD 4, 9-6-33w1. Mission Canyon oil well. TD 4,750 ft.

Imperial Rockland 7-19, LSD 7, 19-4-4w2. Mission Canyon oil well. TD 4,750 ft.

OKLAHOMA

Alfalfa County: Western Oil & Gas Co. 1 Crissup, 2 miles northeast of North McWillie field in NE SW 7-24n-10w. IPF 12 BDPD, 650 M.c.f. of gas, Mississippi lime 6,210-56 ft., 10/63-in. choke, 70°. TD 6,276 ft. (Gas-distillate discovery).

Okfuskee County: Amerada Petroleum Corp. 1 Coleman, 1½ miles west of West Hillby, NW NW NW 32-13n-7e. IPF 116 BOPD, Dutcher sand 3,774-96 ft., 42.9°. TD 4,350 ft. (Oil discovery).

TEXAS GULF COAST

Harris County: Houston Oil Co. 4 Dwyer et al, HT&B Sur., A-399 (1 mile southwest of Westfield). IP 119.50 BOPD, 11/64-in., 36°. Perforations 6,235-40 ft. TD 7,714 ft. (New pay in Bammel field).

Matagorda County: Shell Oil Co. 1 State, Tract 488, Gulf of Mexico. IP 8,000 M.c.f. daily, open-flow potential, dry gas, perforations 4,370-80 ft., and (dual completion) 13,500 M.c.f. daily, open-flow potential, dry gas, perforations 4,000-10 ft. TD 8,011 ft. (Two new pays and extensions in Kain field — offshore from Matagorda Peninsula).

Nueces County: Tri Mark Oil Co. 1 Rand Morgan, Lot 12, Artemas R. Roberts Subd., T. T. Elliott Farm Lots Survey 415. IPP 112.3 BOPD, 23°, perforations 3,703½ ft. TD 5,039 ft. (New field—Rolling Acres).

San Patricio County: The Texas Co. 1-B J. F. Welder heirs, Julian de la Garza Sur., A-8. IP 9,500 M.c.f. daily, open-flow potential, GOR 57,080 cu. ft. per bbl., 55.3°, perforations 7,190-99 ft. TD 8,414 ft. (New pay and extension Odem field).

Willacy County: Superior Oil Co. 2-B Clark-Cowden, Lot 9, Block 1, Harding-Lindahl Subd., San Juan Carricitos Grant, A-8. IP 80 BOPD, ⅛-in., 39.8°, perforations 8,515-22 ft. TD 9,508 ft. (New pay in Chess field).

SOUTHWEST TEXAS

Bastrop County: Sunray Mid-Continent Oil Co. and Skelly Oil Co. 1 Holme, J. G. Addison Sur., A-76. IPP 30 BOPD (net) and 11.67 BW per day, 43.1°, perforations 4,474-85 ft. (Navarro). TD 9,800 ft. in Lower Cretaceous-Sligo. Elev. 568 ft., top Navarro section 4,420 ft., Austin chalk 6,070 ft., Rodessa 8,900 ft., and Sligo 9,620 ft. (New field).

LaSalle County: Sixth M. E. Andrews, Ltd., H&GN RR. C. Sur., A-1084. IP 50.735 BOPD, ⅛-in., 48°, perforations 5,397-5,405 ft. TD 5,422 ft. (New field—Two Fingers).

WYOMING

Big Horn County: Ohio Oil Co. 5 Cozzens, Lot 46-56n-97w. IP 230 BOPD, Amsden discovery, new pay. TD 7,765 ft. Gros Venture.

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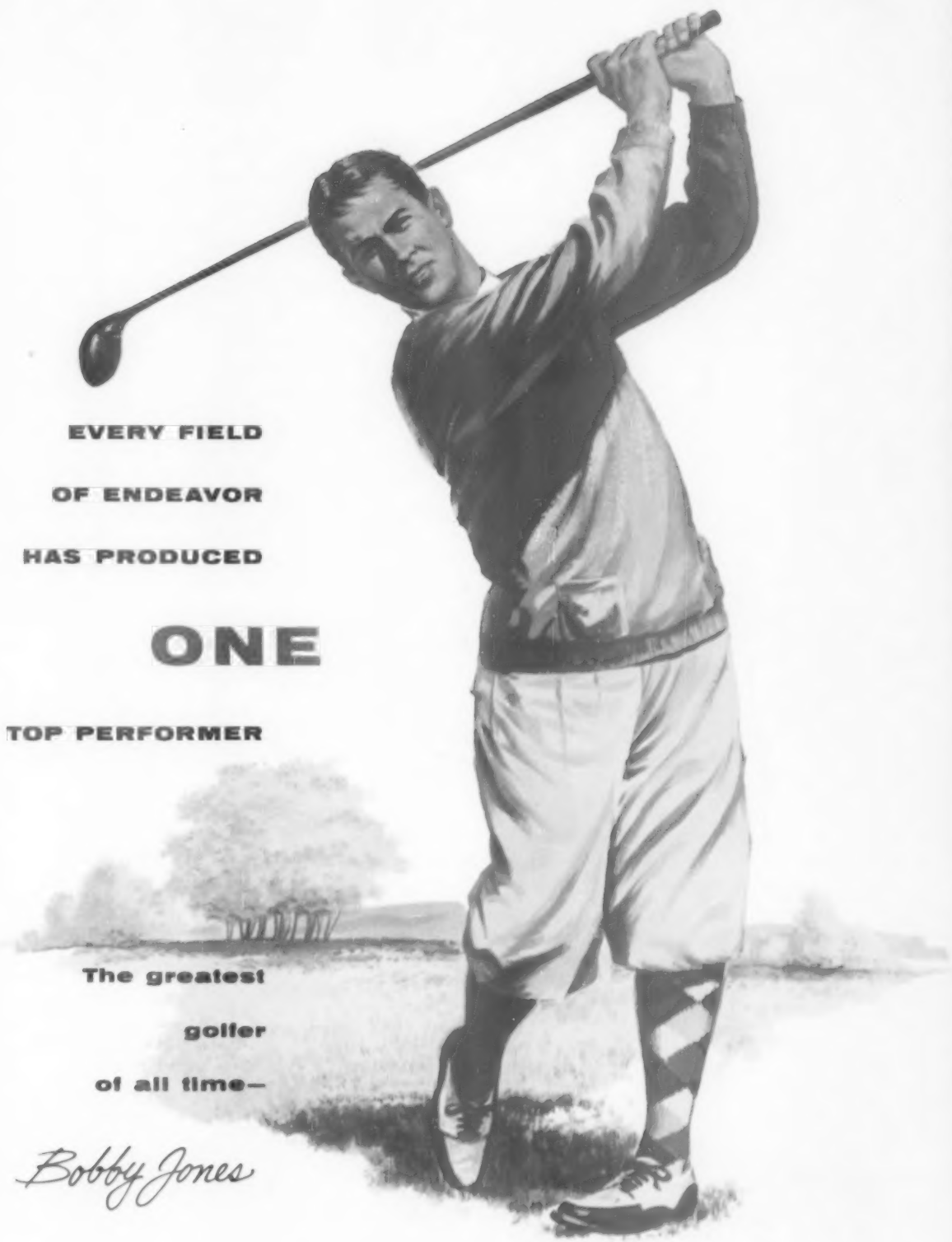
San Angelo Society Releases Guidebook

The San Angelo Geological Society has published a guidebook of the Four Provinces Field Trip, conducted March 16-17, 1956. Leaders of the trip were Virgil E. Barnes, Robert Pavlovic, and Roy T. Hazzard.

The field trip covered the Central Mineral Region, Balcones fault zone, Kerr basin, and the Rio Grande embayment. It was the second field trip of the San Angelo group. The first trip sponsored by this group was a study of the Cambrian in the Llano area, March 1954. This book may be obtained from the Society office at 604 McBurnett Building, San Angelo.



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Industry won't be "goat" as . . .

. . . Miller Tackles Smog Problem

WHEN Otto N. Miller, Standard Oil Co. of California manufacturing vice president, was asked in Honolulu if his company's proposed refinery there would create smog, he flatly replied:

"Any refinery we build here will in no way contribute to air pollution in your community."

The direct response is typical of Miller's approach to the smog problem and its relationship to refinery operations. As a long-time manufacturing executive, he regards attempts to pin the blame for smog on refineries as a personal challenge.

Miller, newly elected chairman of Western Oil and Gas Association's smoke and fumes committee, can be expected to dispatch this assignment with characteristic forthrightness.

Following the pattern established by previous committee chairmen, he promises:

"If we're responsible in any way, you may be sure that we'll go on doing our utmost to correct the situation, as we have done in the past. And, as in the past, if we're innocent, you can be sure that we won't stand still for any sweeping accusations that try to make the oil industry the goat."

Sound background . . . Miller's practical approach to his industry's problems is based upon extensive academic training. Born in Iowa in 1909, he earned a bachelor of science degree in 1930, took his master's at the University of Michigan in 1932 and Ph.D. in 1934.

Joining the Standard of California organization after college, Miller went into research and development work, with emphasis on cracking. Among the succession of assignments he later held was the job of chief process engineer during construction of the Ras Tanura refinery in Saudi Arabia. Subsequently, he headed the cracking division at the El Segundo, Calif., plant.

Early in 1946 Miller was named assistant to the vice president in charge of manufacturing and, in July of that year, general manager of the company's manufacturing department. He was elected a vice president in 1954 and now directs the company's West Coast manufacturing activities.

Despite the heavy demands of his manufacturing post, Miller manages to find time for his main hobby, "the great out-of-doors." Much of his leisure is spent with rod or gun in pursuit of fish or game.

Miller is active in the American Petroleum Institute and holds memberships in the American Institute of Chemical Engineers, Quadrangle, Alpha Chi Sigma, Sigma Xi, Tau Beta Pi, and Pi Lambda Upsilon. He is also active in Michigan University alumni affairs.

He lives in San Francisco with his wife and teen-age son and daughter.

Personals

Floyd Brett, former assistant division manager for Sinclair Oil & Gas Co. in Fort Worth, has been transferred to Midland, Tex., where he'll head a newly formed division. Brett's staff is composed of personnel from Midland, Fort Worth, Odessa, Tex., and Tulsa offices.

W. J. Scott, general superintendent of Pacific Western Oil Corp., Los Angeles, has been elected a director of Skelly Oil Co. He replaces **George F. Getty II,** executive vice president of Pacific Western, who has resigned. Getty also relinquished his seat as director of Mission Oil Corp. He has been nominated as a director of Tide Water Associated Oil Co.

Chester Bonar, Atlantic Refining Co. district geologist, has been transferred from Bismarck, N. D., to Lake Charles, La. **Douglass Bacon** becomes acting district geologist in Bismarck.

Mike Owens, geophysicist for Stanolind Oil & Gas Co., has been transferred from Bismarck, N. D., to Salt Lake City.

Robert Laughlin, Stanolind Oil & Gas Co., **J. L. Traver,** The Texas Co., **J. C. Rathbun,** Superior Oil Co., and **Harry Boyd-Snee,** Stanolind Oil Purchasing Co., have been elected directors of North Dakota Oil and Gas Association.

Thell B. Fowler, Jr., has resigned as division engineer with Transcontinental Gas Pipe Line Co. in Corpus Christi to join Fish Northwest Constructors, Inc., as division engineer in Vancouver, Wash.

Robert E. Maescher has been named superintendent of General Petroleum Corp.'s Torrance, Calif., refinery.

Orval Denman has resigned as geologist for Stanolind Oil & Gas Co. in Tyler, Tex., to join Mark A. Eidlebach, San Angelo, Tex., independent.

C. H. Kallenberger, former district petroleum engineer for The Texas Co. in Salem, Ill., has been promoted to assistant division petroleum engineer in Tulsa. Other Texaco production changes: **E. F. Saunders,** from petroleum engineer in Tulsa to assistant district petroleum engineer in Wichita; **C. F. Mahoney,** from petroleum engineer in Salem to the Tulsa division secondary-recovery section; **W. F. Stone III,** from petroleum engineer in Tulsa to secondary-recovery engineer in Salem; and **E. R. Welch,** from petroleum engineer in Sims, Ill., to the Tulsa secondary-recovery section.

Personals

K. A. Stierman, construction coordinator for Sohio Petroleum Co. in St. Louis, has been named to head the engineering department's construction group there. **James Gardner** has been transferred from corrosion engineer in Grayville, Ill., to the St. Louis staff.

W. R. Lasseigne, assistant production superintendent for Union Oil & Gas Corp. of Louisiana, has been transferred from Sulphur to Lake Charles, La.

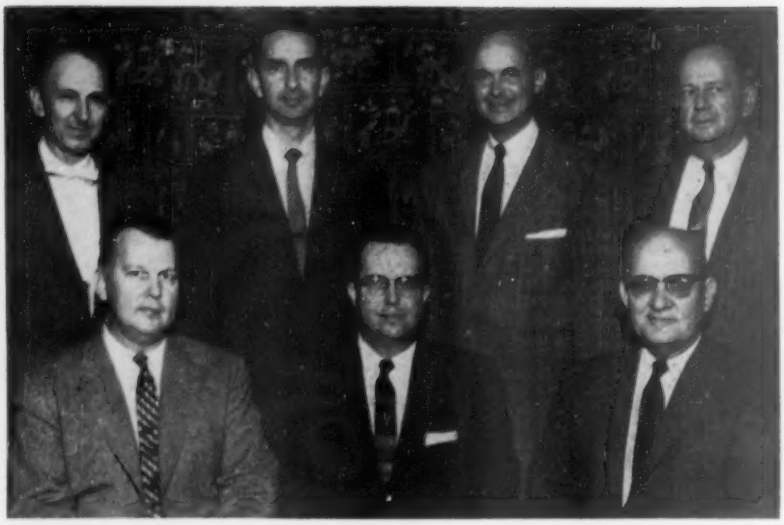
Frank M. Brooks, who'll resign May 1 as director and vice president of El Dorado Refining Co., El Dorado, Kans., has been named vice president and a director of Sterling Drilling Co., Sterling, Kans. Brooks had been with El Dorado 10 years. Earlier he was a geologist for Gulf Oil Corp.

Claude W. Bard has been promoted by Garvey Drilling Co., Wichita, from general drilling superintendent to general manager. He succeeds **Robert White,** who resigned recently to become president of Trans-Era Petroleum Co.

J. R. Atkinson, Inland Producers Co., Evansville, has been elected president of the Indiana Oil and Gas Association. Other new officers: **John B. Buchman,** independent, first vice president; **Tom Egan,** independent, second vice president; and **E. J. Reading,** Sun Oil Co., secretary-treasurer. All reside in Evansville.

A. L. Walker, formerly with Gulf Oil Corp., has joined Mohawk Petroleum Co., as foreman of a new Osage County district headquartered in Pawhuska, Okla.

Edward A. Metcalf and **Harry E. Cotton,** veterans in refinery operation for Standard Oil Co. (Ind.) and predecessors, are retiring after 80 years' combined service. Metcalf, manager of Indiana Standard's Neodesha, Kans., refinery, will retire June 6. He'll be succeeded by **P. Craig Livesay,** now assistant manager of the Sugar Creek, Mo., refinery. Cotton, manager of the Wood River, Ill., plant, will be succeeded July 6 by **Louis H. Butterworth,** his assistant there. Metcalf began work at the Neodesha plant in 1913. He was superintendent when Indiana Standard bought the plant in 1932 and became manager in 1942. Cotton joined the old Midwest Refining Co., Casper, Wyo., in 1919. He was named Wood River manager in 1953.



Illinois Oil Men Reelect Officers

The Illinois Oil and Gas Association reelected all officers at its recent eleventh annual meeting in Mt. Vernon, Ill. David R. Stewart, of Moses & Stewart, Mattoon, Ill., independent, was renamed president. The officers, front left to right, are: Thomas N. Duncan, estate of N. V. Duncan, Fairfield, Ill., second vice president; Stewart; and E. J. Reading, Sun Oil Co., Evansville, Ind., first vice president. Back row, left to right, are: Homer Rutherford, Rutherford & Co., Mt. Vernon, third vice president; Charles J. Pardee, Jr., Mt. Vernon, executive secretary; C. R. Collins, Collins Brothers Oil Co., Mt. Vernon, treasurer; and O. F. Beaty, Magnolia Petroleum Co., Mt. Vernon, secretary.

A. S. Dickason and **C. J. Little** have been named district geologists in two new Lion Oil Co. district production and exploration offices in Houston and Albuquerque. Dickason joined Lion in 1954 as geologist in Corpus Christi. Little joined the firm's Casper, Wyo., district office in 1955.

Dr. Alan S. Michaels, of the Massachusetts Institute of Technology faculty, will be guest lecturer at Louisiana State University's graduate summer program, August 20 - September 7, in Baton Rouge. Course title will be "Petroleum and Chemical Engineering Applications of Surface and Colloidal Phenomena."

Albert H. Weil, of United Gas Pipe Line Corp., Shreveport, has been reelected president of Natural Gasoline Association of America. **John Kindle,** Lone Star Producing Co., Dallas, was elected a vice president. **C. D. Gard,** Union Oil Co., **W. F. Matheny,** of Sid Richardson Gasoline Co., and **George T. Tennison,** Shell Oil Co., were reelected vice presidents. Renamed secretary-treasurer was **William F. Lowe,** Tulsa.

Fred Nelson, former landman in Gulf Oil Corp.'s Rocky Mountain area, has been named vice president and manager of Exploratory Drilling Co.'s Oklahoma-Kansas division. The Denver firm recently opened an office in Tulsa.

J. B. Fisher, president of Kendall Refining Co., Bradford, Pa., has been elected a director of Texas Gulf Producing Co., Houston. He succeeds **W. A. Hendrickson,** who has resigned. Hendrickson will retire May 1 as vice president, treasurer, and secretary.

Wallace A. Howes, Jr., has resigned as gas supply engineer for Panhandle Eastern Pipeline Co. in Liberal, Kans., to join the reservoir engineering department of Natural Gas Pipeline Co. of America in Amarillo. **E. K. Thomas,** chief engineer of Panhandle Eastern's Liberal compressor station 17 years, has been transferred to the Sneed compressor station near Dumas, Tex.

Paul S. Moore, U. S. Geological Survey engineer, has been transferred from Ogden, Utah, to Oklahoma City.

W. R. Kelley, General Petroleum Corp. senior drilling engineer, has been transferred from Bakersfield to Los Angeles.

Allen D. Carson, Cities Service Gas Co. engineer, has been transferred from Wichita to Oklahoma City.

William F. Oline has resigned as geologist-seismologist for Standard Oil Co. of California in Los Angeles to join Pacific Northwest Pipeline Corp. as junior geologist in Albuquerque.

Personals

Charles W. (Wes) Porter has resigned as research geologist with Tide Water Associated Oil Co. in Los Angeles to join Trico Oil & Gas Co., Bakersfield, as district geologist. **Gordon H. Wells,** formerly with Intex Oil Co., has joined Trico as production engineer.

Hugh M. Pendley, assistant superintendent of Northern Natural Gas Co.'s compressor stations since 1948, has been named purchasing agent. He succeeds the late C. Frank Martin. **Jack W. Seaman,** former staff assistant in the compressor department, takes Pendley's post. **F. D. Stockman** has joined Northern Natural as chief of services in the gas-service and availability section. He had been with Phillips Petroleum Co.'s economics department, Bartlesville.

Tate Thigpen, Picayune, Miss., attorney, has been named to a 4-year term on Mississippi's State Oil and Gas Board. He replaces **George M. Ethridge, Jr.,** Meridian.

Walt Dobbs, Wichita Falls, has been named vice president in charge of oil and gas production for Pan Cuba Oil & Metals Corp. He'll also head Oro Negro Drilling Co., Havana, which Pan Cuba has acquired in a stock purchase deal. Oro Negro has 55,000 acres in Havana province. With Pan Cuba, it recently acquired 25,000 acres in Las Villas. Dobbs succeeds **Lincoln G. Valentine,** prominent in Cuban industry, as president of Oro Negro.

Henry Carter Rea, Denver consultant, has returned from a 2½-month study of the political and economic climate in India. Rea sought to determine the feasibility of investing private American capital in development of the country's oil resources. Before World War II he spent several years in exploration work there.

Ralph S. Nabors, Pacific Gas & Electric Co. northern division superintendent, has been promoted to field superintendent of the firm's 502-mile pipeline. He succeeds **Fred E. Wilson,** who retires July 1.

Arthur W. Picone has resigned as process engineer for Delhi-Taylor Oil Corp., Dallas, to join Fluor Corp. in Houston.

Warren J. Teichman, Holbrook, Ariz., has joined Shell Oil Co.'s Oklahoma City geological staff.

C. G. (Larry) Bailey has resigned as division geologist for Texas Pacific Coal & Oil Co. in Denver.

Dr. Sylvain J. Pirson has resigned as professor of petroleum engineering at the University of Texas to join Jack Grynberg & Associates, Denver, as a consultant. He'll aid in oil and gas property valuation, reservoir studies, and quantitative electric log interpretation. Pirson went to the Texas University faculty February 1 after resigning as special research associate in Stanolind Oil & Gas Co.'s Tulsa research center. Earlier, he was on the faculty at Pennsylvania State University.

Joe Hopkins has resigned as geologist with El Paso Natural Gas Co. in Rock Springs, Wyo., to join Union Pacific Railroad in Rawlins, Wyo.

James E. Grubbs has been promoted by Texas Gas Transmission from division superintendent in Guthrie, La., to assistant dispatching superintendent in the firm's Owensboro, Ky., Headquarters.

Brig. Gen. Will W. White, who recently finished a 1-year assignment as director of the Defense Department's Petroleum Logistics Division, has been elected a vice president of Esso Research & Engineering Co. White, a veteran of over 25 years in the aviation fuel and lubricants field, will serve as consultant and adviser on petroleum products used in aircraft. His post in the research and engineering arm of Standard Oil Co. (N. J.) is a newly created one. White joined what is now Esso Standard Oil Co. in 1930, after 7 years' with the Army. He returned to active service in 1942 with the infant Petroleum Administration for War. He rejoined Esso at the end of World War II and was elected a vice president of Esso Export Corp. in 1947. He managed the firm's aviation department until 1954, when he again was called to active duty.

Glynn R. Kruger, formerly with Union Tank & Supply Co. and Delta Engineering Corp., both of Houston, has joined Procon, Inc., Des Plaines, Ill., as process engineer.

Norman O. Morse has been shifted by Shell Oil Co. from senior technologist in New York to assistant chief technologist at the Houston refinery.

D. E. Jones has been promoted by Phillips Petroleum Co. from development engineer in Casper, Wyo., to district engineer in Rangely, Colo.

Paul F. McBride has resigned as assistant chief engineer of Algonquin Gas Transmission Co., Boston, to join Fish Northwest Constructors, Inc., as assistant construction superintendent in Salt Lake City.

James A. Hatfield has been advanced by Plantation Pipe Line Co. from western division superintendent, Baton Rouge, to assistant general superintendent in the firm's Atlanta headquarters. **H. M. (Dutch) Dreyer, Jr.,** moves from central division superintendent to succeed Hatfield. **Edwin A. Birge** takes Dreyer's post, and **Glenn H. Church** moves up from temporary to permanent superintendent in Plantation's eastern division.

B. H. Wierick has resigned as district geologist for American Liberty Oil Co. in Casper, Wyo., to join Owanah Oil & Development Co. as geologist there.

Richard F. Vincent, gasoline plant foreman for The Texas Co., has been transferred from Santa Fe Springs to Santa Paula, Calif.

Edgar O. McCutchen has been promoted by Western Geophysical Co. from computer in New Orleans to chief computer in Ecuador.

Kenneth W. Stout has been promoted by Continental Oil Co. from landman in Corpus Christi to assistant division land superintendent in Denver.

A. J. Howell has resigned from Midstates Oil Corp., Oklahoma City, to join Ambassador Oil Co. as geologist there.

Jay Pierce, president of Pierce Construction Co., gasoline plant, gathering system, and products terminal contractor, has moved his headquarters from Ponca City, Okla., to Tulsa.

Henry Loomis has resigned as geologist for Phillips Petroleum Co. in Denver to join Garfield & Pasternack, independents there.

Charles Andrews, former staff representative of Petroleum Information, Inc., in Casper, Wyo., has joined Richfield Oil Corp. as geologist there.

B. M. Gottlieb, production research coordinator for Sun Oil Co. in Dallas, has been named vice chairman of the Oil Industry Information Committee's North Central Texas area.

Personals

A. E. Herrmann, Amarillo independent operator, has been elected president of Texas Independent Producers and Royalty Owners Association. **G. Scott Hammonds,** Dallas, was re-elected secretary. **Vance Foster,** oil department vice president, First National Bank of Dallas, was elected treasurer. Foster succeeds **William T. Beard, Jr.,** vice president of San Antonio's Alamo National Bank, who held the post 8 years. Herrmann, one of the organizers of TIPRO, is a former member of the group's executive committee. He has been active in Texas independent oil circles since 1921. He was a founder of both Panhandles Producers and Royalty Owners Association and Independent Petroleum Association of America.

A. E. HERRMANN

Dick Tothill has been promoted by Continental Oil Co. from trainee to geologist in the Abilene, Tex., exploration office.

Richard H. Maywald, a 1955 graduate of the University of Minnesota's geological engineering school, has joined the staff of the North Dakota Geological Survey.

John H. Williams, president of Williams Brothers, Tulsa-based pipeline construction firm, recently was awarded Bolivia's Order of the Condor, highest honor conferred by that country. The award was bestowed by Bolivia's foreign relations minister.

E. F. Kindsvater, manager of Phillips Petroleum Co.'s rocket fuels division, Bartlesville, Okla., has been elected president of Farm Chemicals Development Corp. The development company was formed to mine and process potash on a 13,000-acre deposit in southeastern New Mexico. Kindsvater joined Phillips in 1930 and was named to the rocket fuels post in 1952.

Wilbur E. Kelley, former manager of the U. S. Atomic Energy Commission's New York operations office, has been elected president of Walter Kidde Nuclear Laboratories, Inc., Garden City, L. I. He succeeds **Henry K. Norton,** who continues as a director. Kelley was one of the first engineers to work on the Manhatten Project. Since 1953 he has been engineering vice president of Catalytic Construction Co., Philadelphia.

Walter H. Davidson has been elected operating vice president of Transcontinental Gas Pipe Line Corp., Houston.

A. H. Daniel has been promoted from toolpusher for Penrod Drilling Co., in Alvin, Tex., to drilling superintendent for Hunt International Oil Co.'s Pakistan operations in Karachi.

E. L. Hukill, Jr., has resigned as terminal superintendent with African Petroleum Terminal, Abidjan, Ivory Coast, F.W.A., to join Dixie Carriers, Inc., as operating assistant in Harvey, La.

Archie D. Gray, general counsel of Gulf Oil Corp., has been named a member of the American Petroleum Industries committee. He succeeds **David Proctor,** executive vice president and a director of Gulf, who resigned.

J. P. Uitentuis, drilling superintendent for Shell D'Arcy Petroleum Development Co. of Nigeria, Ltd., on July 1 will become drilling superintendent at British Malayan Petroleum Co.'s 110,000-bbl. daily field at Seria, Brunei, British Borneo. He'll succeed **Cornelis (Kees) Hoekendyk,** who is retiring after 29 years overseas service with the Shell Group. Also retiring is **C. H. Vincent,** senior drilling foreman and veteran of 12 years in Borneo.

James C. Bell has rejoined Service Pipe Line Co.'s corrosion department. Until recently he had been with Corrosion Services, Inc., Tulsa.

Dr. Harold R. Snow, manufacturing vice president of American Oil Co. since 1954, has been elected a director. Snow joined the parent Standard Oil Co. (Ind.) in 1925 as research chemist. He was named manager of Amoco's Texas City, Tex., plant in 1947, and elected vice president and general manager of refining in 1950.

James Freeland has resigned as district landman for Shell Oil Co. in Amarillo to join Petroleum, Inc., as vice president and land department manager in Wichita.

Tom Henderson has resigned from Gene Reid Drilling Co., Bakersfield, Calif., to join Union Oil Co. as junior engineer in Santa Fe Springs, Calif.

A. L. Saulsbury, a veteran of 40 years with General Petroleum Corp., has been promoted to drilling superintendent in the firm's southern division.

DEATHS

Guy A. Most, 81, pioneer in the Oklahoma oil industry, died April 15 in his Tulsa home. Most retired 11 years ago as general superintendent of Sinclair Oil & Gas Co. He began as tool pusher for the old Sutton Drilling Co., Bartlesville, Okla. Later he became assistant general superintendent of Prairie Oil & Gas Co., which later merged with Sinclair.

Jesse J. Jenkins, 68, Kilgore, Tex., independent, died there recently. Jenkins drilled over 300 producing wells in the Kilgore townsite area after moving there from Wichita Falls in 1933.

William Wallace Rew, 87, who went to work for Waters Pierce Oil Co. in 1883 and retired in 1934 as Dallas district manager for Magnolia Petroleum Corp., died April 15 in Dallas.

Judge C. R. Starnes, 70, well-known East Texas independent, died April 12 in his Gladewater, Tex., home.

Frank R. Schrot, 67, production superintendent for the Leo Schrot enterprises in Michigan, died recently in his Mount Pleasant, Mich., home.

Layton A. Boyd, 59, chief engineer for Born Engineering Co., Tulsa, and for many years a leading natural-gas engineer, died April 12 in San Angelo, Tex. Boyd joined the Born firm in 1950 after 2 years as chief engineer and plants superintendent for Texas Natural Gas Corp. Earlier he was chief engineer for Warren Petroleum Corp.

John F. (Pat) Patterson, production manager of Husky Oil & Refining Co., Ltd., Calgary, died April 9 in Salt Lake City. He was 44. Patterson had been with Husky, subsidiary of Husky Oil Co., Cody, Wyo., since 1947. Earlier he was with Phillips Petroleum Co.

Fred D. McMahon, 64, West Texas division superintendent for Humble Pipe Line Co. in Midland, Tex., died there April 16. McMahon joined Humble in 1919 as a connection foreman. Later he served as assistant general superintendent in Houston.

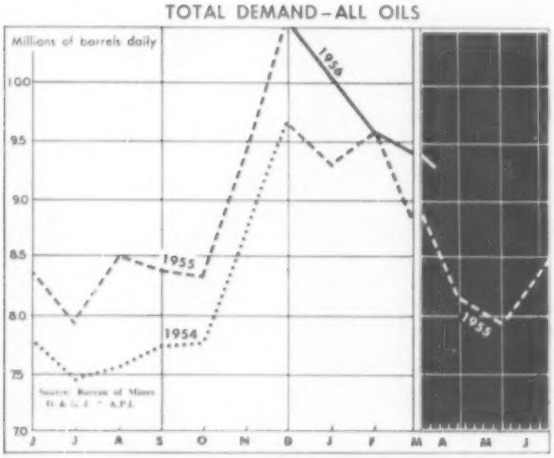
James Kessler, 53, owner of Diamond Petroleum Co. and Dixie Oil Co., both of Denver, died there recently. He also was president of Diamond Gas & Fuel Co., Denver.

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,193,800	DOWN	1,700	UP	299,510
Crude stocks	263,823,000	UP	1,757,000	DOWN	5,228,000
Completions	1,061	DOWN	58	DOWN	45
Refinery runs	7,551,000	UP	34,000	UP	420,000
Gasoline stocks	195,059,000	DOWN	2,263,000	UP	13,195,000
Kerosine stocks	17,607,000	DOWN	37,000	DOWN	1,844,000
Distillate stocks	60,832,000	UP	24,000	DOWN	2,528,000
Residual stocks	32,788,000	UP	137,000	DOWN	11,953,000
Four-product stocks	306,286,000	DOWN	2,139,000	DOWN	3,130,000
Total imports	1,271,000	DOWN	92,600	UP	44,500

TOTAL DEMAND – ALL OILS



This Is the High Year of a Two-Year Cycle in Gasoline Stock Increases

WHAT effect will additions to gasoline inventories this spring have on summer markets? This question is getting more attention from marketers than any other distribution problem.

The last big gain in stocks for the start of a gasoline season was in 1954. At the end of March of that year, gasoline stocks were up almost 20,000,000 bbl. from the year before. This troublesome increase was combined with a very small gain in gasoline demand to put pressure on markets in many areas. Total gasoline demand for the second and third quarters of 1954 averaged only 0.8 per cent more than in the same months of 1953.

Gasoline stocks on April 13 represented a gain of 13,195,000 bbl. over the corresponding date last year, and most industry planners are expecting a summer gain in gasoline demand of at least 4 per cent over last summer. No one is expecting another 1954.

For the past few years, gasoline stock increases at the start of the season have tended to follow a 2-year cycle. Gasoline stocks on March 31, 1952, represented a gain of 11,000,000 bbl. over the previous year. This was followed by a 2,000,000-bbl. increase for the year ended March 1953. Again, a gain of 20,000,000 bbl. for 1954 was followed by a net increase of only 2,700,000 bbl. for March 1955. This year seems to be the high year of the next cycle.

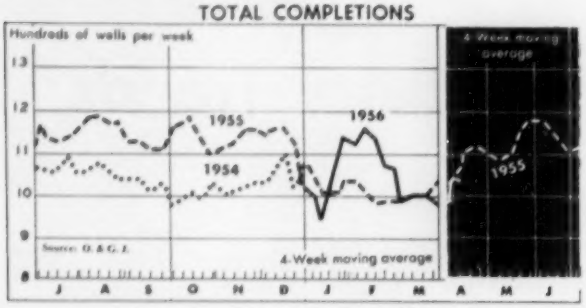
Gasoline-stock increases, measured at the end of the first quarter, have averaged 9,500,000 bbl. a year since 1947. This year is above the 9-year average but not as much above as last year was below. Compared with last year, four districts have gasoline-stocks gains above 2,000,000 bbl. They are East Coast, Oklahoma-Kansas, California, and Texas Gulf.

Cool weather boosts distillate demand . . . Most of the North Central and Northeastern states had cooler-than-normal weather during the first half of April. Since small temperature drops produce disproportionate changes in fuel use at the end of the season, the cooler first half of April resulted in a distillate inventory drop of 1,751,000 bbl. compared with a gain of 1,426,000 bbl. for the same weeks last year.

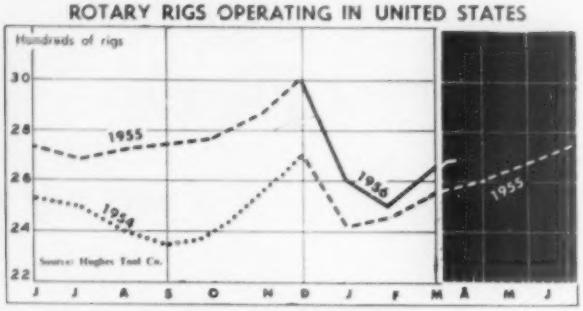
STOCK COMPARISONS
(Thousands of barrels)

	Gasoline		Distillate	
	4-13-56	4-15-55	4-13-56	4-15-55
East Coast	40,158	37,872	17,697	21,835
Appalachian 1	4,709	4,848	1,180	1,390
Appalachian 2	3,090	2,684	621	612
Ind., Ill., Ky.	41,061	39,166	10,279	9,972
Okla., Kans., Mo.	22,569	18,692	6,629	6,463
Inland Texas	7,203	6,803	1,264	1,190
Texas Gulf	27,686	25,613	8,080	6,692
Louisiana Gulf	10,575	11,447	4,068	3,606
N. La. and Ark.	4,251	4,511	1,080	1,161
Rocky Mountain:				
New Mexico	291	149	87	80
Other Rocky Mtn.	8,076	8,335	2,094	1,977
California	25,390	21,744	7,753	8,382
Total U. S.	195,059	181,864	60,832	63,360

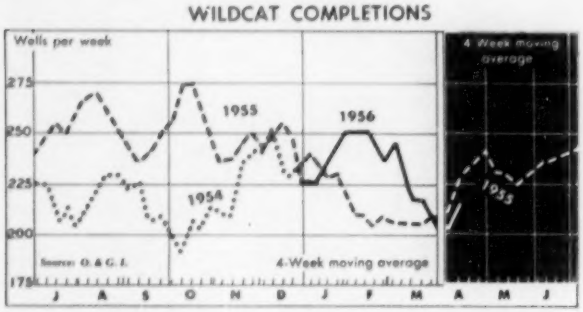
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS*

Area—	4-16-56	Change from 4-9-56	Change from 4-18-55
Gulf Coast	633	—18	46
N. and W. Texas-New Mexico	930	—7	70
Arkansas-N. Louisiana-E. Texas	177	17	7
Oklahoma	333	10	9
Kansas-S. Nebraska	175	—1	—5
Illinois-Eastern	97	—10	—35
Rocky Mountain	207	10	—
Pacific Coast	133	2	—22
Total United States	2,685	3	70
Western Canada	108	—17	—10

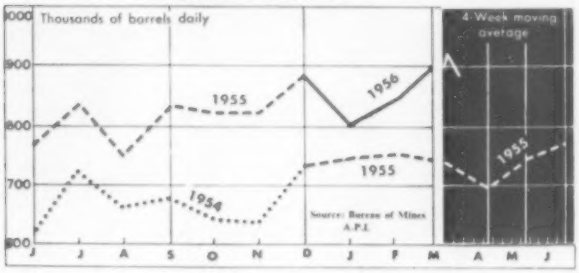
*Hughes Tool Co.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED APRIL 14, 1956

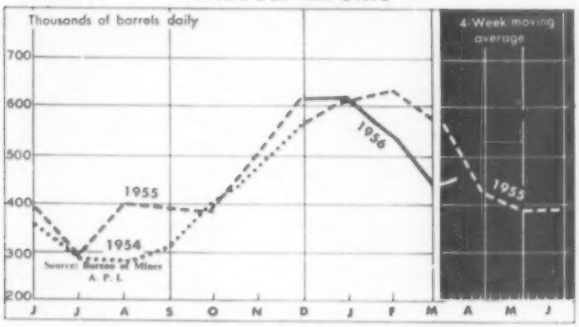
	Total of all wells: Comp.	Oil	Gas	Dry	Footage	Cum. 1956	Cum. 1955	Wildcat completions and discoveries: Oil	Dist.	Gas	Dry	Total	Cumulative total, 1956: Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	3	3	0	0	34,680	29	32	0	0	0	0	0	0	0	1	15	16
Arkansas	16	12	0	4	47,390	215	185	1	0	0	3	4	11	0	2	32	45
California	32	19	1	12	148,006	596	729	1	0	0	8	9	11	0	0	119	130
Colorado	19	5	1	13	103,314	311	354	1	0	1	10	12	6	0	4	145	155
Illinois	66	32	1	33	154,922	932	1,028	1	0	0	13	14	13	0	0	149	162
Indiana	14	5	1	8	23,418	177	207	0	0	0	4	4	5	0	1	37	43
Kansas	93	50	8	†35	322,887	1,431	1,430	5	0	1	15	21	33	1	10	243	287
Kentucky	29	10	2	17	39,886	475	348	0	0	0	7	7	9	0	0	110	119
Louisiana	76	39	5	32	595,124	1,094	1,081	0	3	0	13	16	30	21	9	140	200
North	30	15	5	10	112,039	403	567	0	0	0	6	6	8	0	0	47	55
South	36	16	0	20	397,398	553	514	0	3	0	7	10	20	19	5	82	126
Offshore	10	8	0	2	85,687	138		0	0	0	0	0	2	2	4	11	19
Michigan	7	3	0	4	18,035	143	147	0	0	0	2	2	3	0	0	46	49
Mississippi	7	2	0	5	49,764	122	131	0	0	0	3	3	4	0	1	48	53
Montana	3	1	0	2	17,325	96	93	0	0	0	1	1	5	0	0	24	29
Nebraska	30	10	0	20	170,701	262	181	1	0	0	14	15	12	0	0	128	140
New Mexico	40	15	22	3	177,252	505	367	0	0	0	1	1	9	0	5	42	56
Northwest	24	1	22	1	85,618	176	87	0	0	0	0	0	0	0	5	13	18
Southeast	16	14	0	2	91,634	329	280	0	0	0	1	1	9	0	0	29	38
North Dakota	6	5	0	1	50,212	65	59	1	0	0	1	2	3	0	0	13	16
Ohio	19	9	5	5	49,811	304	297	0	0	0	1	1	0	0	1	3	4
Oklahoma	149	98	3	48	507,507	2,488	2,458	1	1	1	12	15	42	9	9	202	262
Pennsylvania-New York	9	0	4	5	50,923	*217	444	0	0	0	0	0	0	0	1	2	3
Texas	416	266	13	137	1,760,480	6,166	5,591	15	0	1	83	99	244	19	52	1,323	1,638
Southwest (1 & 4)	63	27	6	30	294,083	920	888	3	0	0	16	19	50	5	18	268	341
Gulf Coast (2 & 3)	52	32	1	19	332,464	772	747	1	0	1	12	14	21	8	20	202	251
East (5 & 6)	18	6	1	11	82,611	324	295	1	0	0	8	9	4	1	4	121	130
North Central (7-B & 9)	169	104	1	64	510,175	2,144	1,968	8	0	0	35	43	107	0	2	496	605
West (7-C & 8)	95	85	0	10	461,943	1,674	1,403	2	0	0	10	12	61	0	6	216	283
Panhandle (10)	19	12	4	3	79,204	332	290	0	0	0	2	2	1	5	2	20	28
Utah	4	2	1	1	23,194	23	19	0	0	0	1	1	1	0	0	16	17
West Virginia	10	0	8	2	33,124	200	174	0	0	0	0	0	0	0	2	3	5
Wyoming	13	10	0	3	62,187	206	231	1	0	0	1	2	5	0	4	61	70
Miscellaneous	0	0	0	0	0	49	11	0	0	0	0	0	4	0	0	36	40
Total United States	**1,061**	596	75	390	4,440,142	*16,106	15,597	28	4	4	193	**229**	450	50	102	2,937	3,539
Total previous week	1,119	669	69	381	4,667,394			29	1	6	186	222	422	46	98	2,744	3,310
Total April 16, 1955	1,106	640	48	418	4,305,732			37	6	5	184	232	440	59	98	2,659	3,256
Cumulative 1956	*16,106	8,943	1,053	6,110	66,499,100												
Western Canada	32	13	2	17	164,055	750											

Service wells included: †1, ‡10. *Revised.

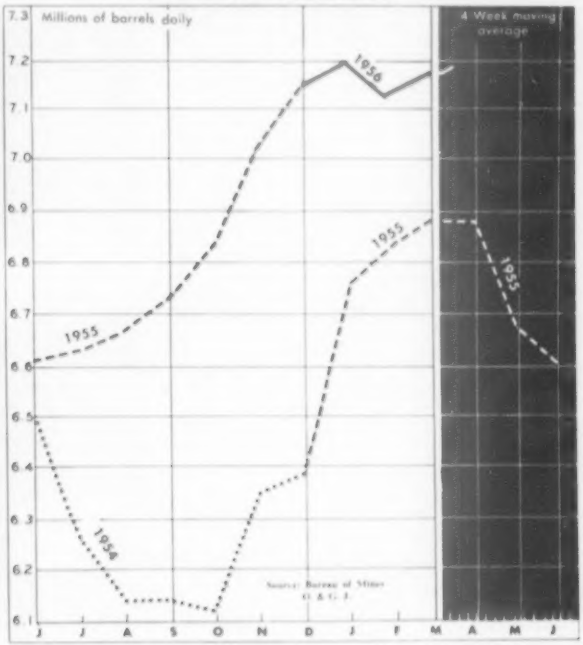
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION

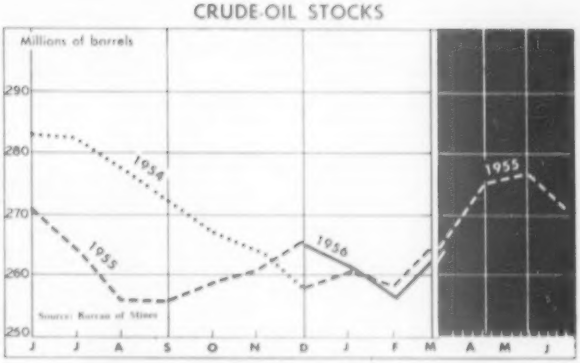


DAILY AVERAGE PRODUCTION FOR WEEK

	April 14 Crude oil	April 14 Lease condensate	April 14 Total	April 7 total
Alabama	4,900		4,900	5,000
Arkansas	72,160	450	72,550	72,900
California	966,500		966,500	967,200
Colorado	163,500		163,500	160,500
Eastern	48,900		48,900	48,400
Florida	1,325		1,325	1,325
Illinois	228,400		228,400	238,900
Indiana	31,000		31,000	31,100
Kansas	338,400		338,400	335,600
Kentucky	46,600		46,600	47,200
Louisiana	757,200	69,100	826,300	827,050
North	117,200	2,100	119,300	120,050
South	640,000	67,000	707,000	707,000
Michigan	29,900		29,900	29,900
Mississippi	107,400	4,400	111,800	111,800
Montana	57,100		57,100	56,300
Nebraska	40,800		40,800	37,400
New Mexico	249,150	4,250	253,400	253,400
North Dakota	36,800		36,800	37,700
Oklahoma	607,500		607,500	607,300
Texas	2,982,200	52,825	3,035,025	3,035,025
Dist. 1	54,500	450	54,950	54,950
Dist. 2	151,000	8,500	159,500	159,500
Dist. 3	429,000	25,400	454,500	454,500
Dist. 4	244,000	5,000	249,000	249,000
Dist. 5	45,000	475	45,475	45,475
Dist. 6	125,700	5,900	131,600	131,600
East Texas field	215,000		215,000	215,000
Dist. 7-B	161,000	50	161,050	161,050
Dist. 7-C	189,000	4,400	193,400	193,400
Dist. 8	1,060,000	1,875	1,061,875	1,061,875
Dist. 9	213,000	600	213,600	213,600
Dist. 10	95,000	175	95,175	95,175
Utah	4,800		4,800	5,100
Wyoming	288,100		288,100	286,200
Others	‡200		200	200
Total U. S.	7,062,775	131,025	**7,193,800**	**7,195,500**
Change from previous week, down			**1,700**	
Canada	†450,600		†450,600	†394,940
Total U. S. production January 1-April 14			746,970,630 bbl.	
Same period last year (crude plus cond.)			*710,590,550 bbl.	

*Includes 12,006,250 bbl. condensate. †Week ended previous Monday. ‡Nevada.

CRUDE-OIL STOCKS



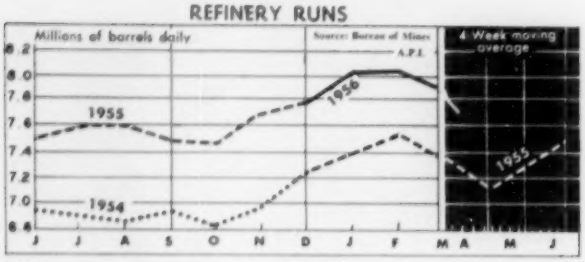
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

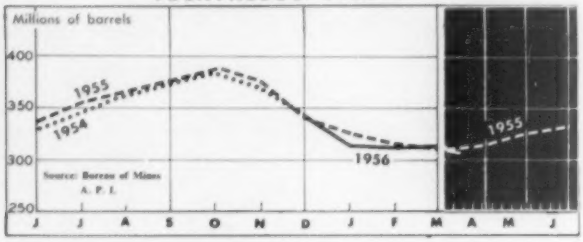
	4-7-56	3-31-56	4-9-55
Pennsylvania Grade	2,627	2,588	2,823
Other Appalachian	2,225	2,161	2,236
Illinois, Indiana, Michigan	9,940	9,174	10,707
Nebraska, North Dakota	1,792	2,018	2,105
Kansas	7,810	7,792	8,395
Oklahoma	23,779	23,440	25,106
Arkansas	2,915	2,632	3,194
Louisiana	16,446	16,410	15,062
North	2,635	2,594	2,425
South	13,811	13,816	12,637
Mississippi	3,060	3,138	3,161
New Mexico	7,632	7,674	8,308
Texas	123,648	123,685	123,647
East Texas	9,205	9,345	10,002
West Texas	61,483	60,770	54,349
Texas Gulf	21,792	21,746	24,485
Other Texas	31,168	31,824	34,811
Wyoming	16,619	15,921	15,233
Other Rocky Mountain	5,771	5,586	5,364
California	27,921	27,976	32,796
Foreign	11,638	†11,871	10,914
Total	263,823	262,066	269,051

*Bureau of Mines. †Includes 2,038,000 bbl. in California.

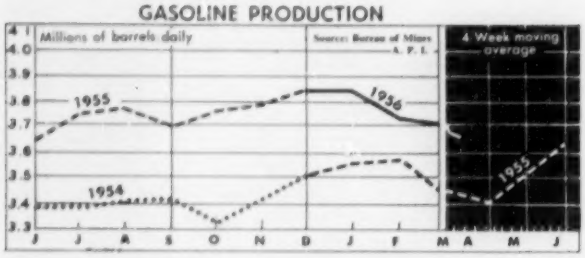
REFINERY RUNS



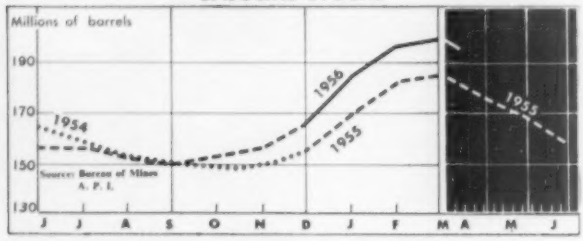
FOUR-PRODUCT STOCKS



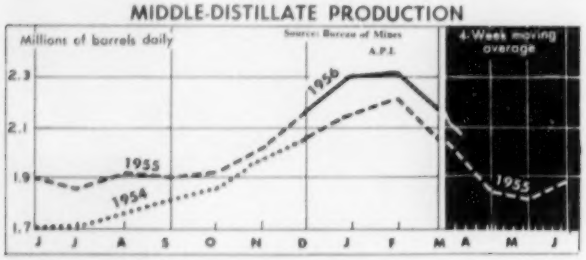
GASOLINE PRODUCTION



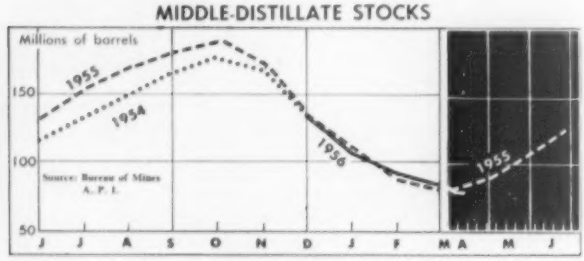
GASOLINE STOCKS



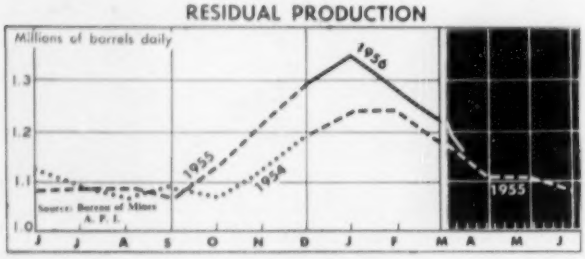
MIDDLE-DISTILLATE PRODUCTION



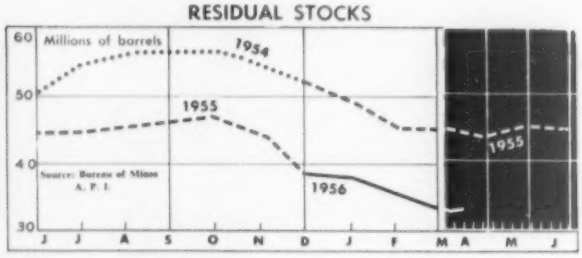
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



A.P.I. REFINERY REPORT, APRIL 13

(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, April 1955 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,046	397.1	25.3	286.4	220.9	40,158	6,813	17,697	7,975	996	398.9	26.5	248.7	203.6
Appalachian:														
District 1	98	37.7	2.3	22.4	8.6	4,709	397	1,180	323	100	41.2	3.9	23.9	7.6
District 2	96	48.7	7.6	24.6	16.7	3,090	409	621	293	82	44.7	4.9	13.9	13.2
Ind., Ill., Ky.	1,336	710.3	78.3	262.7	185.6	41,061	3,248	10,279	3,712	1,262	650.3	66.1	240.8	155.3
Okla., Kans., Mo.	648	364.9	21.7	167.5	23.6	22,569	778	6,629	1,030	591	317.2	16.4	136.5	35.9
Inland Texas	233	185.0	12.6	44.3	23.9	7,203	339	1,264	1,356	259	192.2	11.0	46.0	19.2
Texas Gulf Coast	2,026	931.6	94.0	519.3	255.1	27,686	2,810	8,080	4,904	1,793	819.4	112.3	412.6	238.0
La. Gulf Coast	711	361.7	47.0	165.7	43.1	10,575	1,816	4,068	1,339	643	337.0	53.3	160.7	34.7
N. La. and Ark.	62	26.0	1.7	20.4	3.0	4,251	389	1,080	42	86	31.0	7.9	21.7	6.1
Rocky Mountain:														
New Mexico	22	11.6	...	4.0	2.7	291	6	87	37	21	11.0	0.3	3.5	2.8
Other Rocky Mtn.	196	96.6	2.7	50.6	32.0	8,076	266	2,094	903	226	94.0	3.8	57.7	31.5
California	1,077	459.8	2.1	170.7	353.1	25,390	336	7,753	10,874	1,077	472.4	6.0	168.5	361.7
Apr. 13, 1956	7,551	3,631.0	295.3	1,738.6	1,168.3	195,059	17,607	60,832	32,788	7,136	3,409.3	312.4	1,534.5	1,109.6
Apr. 6, 1956	7,517	3,654.1	334.6	1,739.1	1,079.9	197,322	17,644	60,808	32,651					
Apr. 15, 1955	7,131	3,431.0	311.0	1,548.7	1,146.6	181,864	19,451	63,360	44,741					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Crude-oil and refinery prices at representative U. S. and foreign points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
Regular (86 octane)	11.25-11.50
Premium (94 octane)	12.75-13.00
Gulf Coast (cargoes for coastwise or export movement):	
Regular (90 octane)	11.00-11.25
Premium (97 octane)	13.00-13.25
New York (barges):	
Regular (89 octane)	12.25
Premium (96 octane)	14.50
California—Los Angeles (rack):	
Regular (84 octane)	12.9-13.15
Premium (93 octane)	14.0-14.25
Caribbean area (cargoes):	
Regular (87 octane)	10.50
Premium (93 octane)	11.50

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:	
Grade 26-70	4.5
Breckenridge:	
Grade 26-70	4.0

*If 26-70 natural is considered as 100 per cent, prices for lower-vapor-pressure grades increase 2.5 per cent for each unit drop in Reid vapor pressure down to and including 16-lb. Prices for grades below 16-lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	10.00-10.25
Diesel oil (58 d.i. and above)	9.625-9.875
Distillate No. 1	9.625-9.875
Distillate No. 2	9.00-9.25
Gulf Coast (cargoes):	
Kerosine 41-43	9.25-9.5
Distillate No. 2	8.75-9.25
New York Harbor (barges):	
Kerosine 41-43	10.85
Distillate No. 2	10.35
Diesel fuel, 48-52 d.i.	10.65
Caribbean area (cargoes):	
Distillate No. 2	8.75

WAX (LB.)

Oklahoma (Group 3):	
132-135 A.m.p. (semi-refined) in tank cars	6.50
New York (export):	
★ 126-130 A.m.p. crude scale (solid in bags or barrels)	7.35

★ Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$2.00-2.10
Gulf Coast (cargoes):	
Bunker C fuel	$2.10
New York Harbor (barges):	
Bunker C fuel	$2.65
Caribbean (cargoes):	
Bunker C at Aruba, N.W.I.	$2.10
California (rack):	
Bunker C fuel, Los Angeles	$2.10-2.20

LUBRICATING OILS

Mid-Continent (Group 3):	
150-160 bright stock, solvent refined, 0-10 p.p., 95 v.i.	24
200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i.	20.75
Pennsylvania Grade:	
145-155 vis. at 210, bright stock, 8 color, 25 p.t.	24
200 vis. neutral (180 at 100°), 25 p.t.	21

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Mid-Cont.*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo. (sour)
14-14.9	$2.02				
15-15.9	2.08				
16.16.9	2.13				
17-17.9	2.19				
18-18.9	2.24				
19-19.9	2.30				
20-20.9	2.35	$2.50		$2.37	
21-21.9	2.41	2.52		2.39	
22-22.9	2.47	2.54		2.41	
23-23.9	2.52	2.56		2.43	
24-24.9	2.58	2.58	$2.91	2.45	
25-25.9	2.64	2.60	2.93	2.47	
26-26.9	2.69	2.62	2.95	2.49	
27-27.9	2.76	2.64	2.97	2.51	
28-28.9	2.83	2.66	2.99	2.53	
29-29.9	2.91	2.68	3.01	2.55	
30-30.9	2.97	2.70	3.03	2.57	
31-31.9	3.04	2.72	3.05	2.59	$2.46
32-32.9	3.12	2.74	3.07	2.61	2.48
33-33.9	3.20	2.76	3.09	2.63	2.50
34-34.9	3.27	2.78	3.11	2.65	2.52
35-35.9	3.34	2.80	3.13	2.67	2.54
36-36.9	3.39	2.82	3.15	2.69	2.56
37-37.9		2.84	3.17	2.71	2.58
38-38.9		2.86	3.19	2.73	2.60
39-39.9		2.88	3.21	2.75	2.62
40 and up		2.90	3.23	2.77	2.64

*Includes Oklahoma, Kansas, North Dakota, West Texas (sweet), North Central Texas, North Louisiana, Arkansas, and Wyoming (sweet). †Low-cold-test Gulf Coast. ‡Sour.

Effective dates: California, February 7, 1956; east of California, June 15, 1953; Pennsylvania Grade, March 16, 1956.

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Cotton Valley (distillate)	$3.00
Cotton Valley (Holloway crude)	2.95
Texas:	
East Texas	2.90
Chapel Hill	2.83
Conroe	3.15
Van	2.73
Pennsylvania Grade:	
Bradford	4.20
Middle District	4.07
Southwest Pennsylvania	3.78
West Virginia	3.66
Buckeye Grade	3.60
Zanesville Grade	3.02
Illinois Basin	3.00
Canada:	
Leduc-Woodbend (flat prices D-2, D-3)	2.60
Redwater (Alta.) D-3	2.49
Smiley-Viking (Sask.)	2.26
Fosterton (Sask.)	1.29
Pembina	2.52

FOREIGN

Venezuela:	
Cumarebo, 48°-48.9°, Tucupido	*3.40
San Joaquin, 41°-41.9°, Puerto La Cruz	*3.04
Oficina, 35°-35.9°, Puerto La Cruz	*2.80
Tia Juana medium, 26.5°-26.9°, Amuay	†2.30
Quiriquire, 16.5°-16.9°, Caripito	‡2.21
Lagunillas heavy, flat, Amuay or Las Piedras§	2.05
Bachaquero, 16.5°-16.9°, Amuay or Las Piedras§	‡1.90

*Plus or minus 2 cents per barrel for each degree gravity change. †Plus or minus 2.5 cents per barrel for each half-degree gravity change. ‡Plus or minus 3.5 cents per barrel for each half-degree gravity change. §Also available at La Salina at 3.0 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):	
Arabian, 36.0°-36.9°, Ras Tanura	$1.97
Iranian, 34.0°-34.9°, Bandar Mashur	1.91
Iranian, 34.0-34.9°, Abadan	1.86
Iraq, 36.0-36.9°, Fao	1.87
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.72
Qatar, 39.0°-39.9°, Umm Said	2.06
Middle East, E. Mediterranean:	
Arabian, 36.0°-36.9°, Sidon	2.46
Iraq, 36.0°-36.9°, Tripoli, Banias	2.46
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°-38°	2.60

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Established Oil Company desires geologists for employment in West Texas area. Must know area and have four to six years of active experience in subsurface mapping and interpretation. Excellent opportunity for advancement. Salary will be commensurate with ability and experience. Reply should state age, education, experience, and salary desired.

BOX J-485,
THE OIL AND GAS JOURNAL,
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Active independent oil company has vacancies for graduate petroleum engineers with two to five years of practical experience in drilling and production in West, West Central or North Texas. Excellent opportunities for growth and advancement. Replies should furnish complete personal data, education, experience, and starting salary desired.

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With degree in Physical Chemistry or Chemical Engineering plus 5 years' petroleum production engineering experience which should include 2 years' study of reservoir fluid behavior.

Salaries commensurate with training and experience. Write outlining personal history and work experience. Please include telephone number.

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THE POSITION YOU WANT: Oil Industry companies are looking for men to fill every conceivable kind of position. If you didn't find the position in this column that you are looking for, use a "Situation Wanted" classified advertisement to state your qualifications. Some company is probably looking for your ability. See box heading for classified rates or write The Oil and Gas

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Box J-459,
The Oil and Gas Journal,
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CHEMICAL ENGINEER—5 years selling instruments direct to oil and gas producers, chemical plants, refineries. Background in oil and gas production. Desire engineering position with consulting firm or natural gas producer. Also suited for sales management. Age 30, single. Prefer relocation Dallas or Houston areas, but will go elsewhere. Box J-487, The Oil and Gas Journal, Tulsa, Oklahoma.

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MECH.-CHEM.: Registered prof. engineer; presently overseas, age 41, 14 years with majors and independents in Britain, Canada and South America. Wide experience design, maintenance, construction, estimates and supervisory; 5 years industrial engineering machine shops. Require administrative position, domestic or overseas; available interview U. S. May-June. Write Waite, 4233 Irving Avenue, Dallas 19, Texas.

ENGINEER - LANDMAN - LAWYER wants job with progressive oil company or operator offering opportunity. B.S. & LL.B. degrees, age 35, 10 yrs. experience. Can do engineering or land work, supervise exploration and development or be executive assistant to management. Prefer job developing drilling deals. Box 2702, Midland, Texas.

SUBSURFACE GEOLOGIST—M.S., married, 3½ years domestic experience with major. Desire foreign employment with oil company. Employed. Box J-492, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPLORATION SUPERVISOR—Graduate geologist and business management. Fourteen years domestic and foreign experience geological, land and administration. Now employed in middle management position. Desires connection with aggressive company in administrative or exploratory capacity. Box J-478, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE PETROLEUM Engineer desires position with independent oil company. Eight years experience with major company; principally in field operations. Last four years as production supervisor of large area. Box J-474, The Oil and Gas Journal, Tulsa, Oklahoma.

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GEOPHYSICIST-GEOLOGIST—15 years experience, 5 years supervisory capacity. Desires position with independent or small oil company. Reply Box J-480, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER with 18 years of drilling, oil, distillate and gas well experience. Field and administrative. Handled district organization and petroleum engineering department for major. Desire change to manage independent's operations. Excellent references. Reply Box J-468, The Oil and Gas Journal, Tulsa, Oklahoma.

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MINERALS AND ROYALTIES in choice properties in Texas. Under lease and committed for drilling soon. Priced reasonably. Write or wire for details. Box J-484, The Oil and Gas Journal, Tulsa, Oklahoma.

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CONTACT A. L. Bowles, Box 947, Ada, Okla., for Drilling Deals, Oil Production.

I WILL LEASE for oil or gas development my Texas land. Box 419, Upland, California.

CUBAN OIL PROPERTIES at two producing fields offered. References and immediate drilling required. Drilling Co. Box 2089, Havana, Cuba.

10,000 ACRES under good lease, S. W. Iowa, Forest City Basin, good geology, will assign to drilling firm for exploration. Before July 1, 1956. R. A. Trygg, Ogden, Iowa.

FOR SALE: Producing oil and gas wells and leases located in Garvin, Stephens, Kiowa Counties, Oklahoma. For details call or write, Ralph W. Shebester, Box 337, Pauls Valley, Oklahoma. Telephone 570.

FOR SALE—In Quay, San Miguel and Lincoln Counties, New Mexico. 3400 acres State issued oil and gas leases running full 10-year term. Rentals 10c per acre. Price $2.00 per acre all or part. Engineer's report available. James S. Richards, 1346 Connecticut Avenue, N. W. Washington 6, D. C.

OIL, GAS & URANIUM lease, 78,400 acres New Mexico. Solid tract, one owner. $1.00 per acre bonus, 50c per acre annual rentals 10 year commercial lease. Box J-418, The Oil and Gas Journal, Tulsa, Oklahoma.

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3 STRIPPER LEASES, 800', 27 API, 1,000,000 bbl. estimated recoverable, eastern Kansas $30,000. Owner, Box 393, Lawrence, Kansas.

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Financing needed for oil drilling deals in Southern Coastal Region. Need contact with drilling syndicates or investors in favorable tax brackets to finance several drilling propositions on good geological prospects. Ethical operation. References furnished.
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Box J-483, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED

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LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Land Office, Cheyenne, Wyoming. Notice is hereby given that approximately 1557.96 acres of land in six parcels within the known geologic structure of the Poison Spider field, Wyoming, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre through sealed bids on or before 2:00 P.M., MST, June 7, 1956, when bids will be opened. Details of the lease offering, and how and where to submit bids may be obtained from the Land Office, Cheyenne, Wyoming. Perry T. Williams, Manager.

LEGAL

Sealed Bids will be received until 2:00 P. M. Monday May 7, 1956, and opened at that time at the Pawnee Area Field Office, Pawnee, Oklahoma, for the leasing of allotted lands located in Kay, Noble and Pawnee Counties, Oklahoma, for oil and gas mining purposes. For additional information write or telephone Mr. John L. Johnson, Area Field Representative of the Pawnee Area Field Office (Phone 985).

LEGAL

Sealed bids will be received until 1:00 P.M., Friday, May 11, 1956, and opened at that time at the Shawnee Area Field Office for the leasing of allotted Indian lands located in Cleveland, Pottawatomie, Lincoln, Payne, Oklahoma and Logan counties, Oklahoma, for oil and gas mining purposes. For additional information write or telephone Mr. Robert D. Grover, Area Field Representative, Shawnee, Oklahoma, (Telephone 318).

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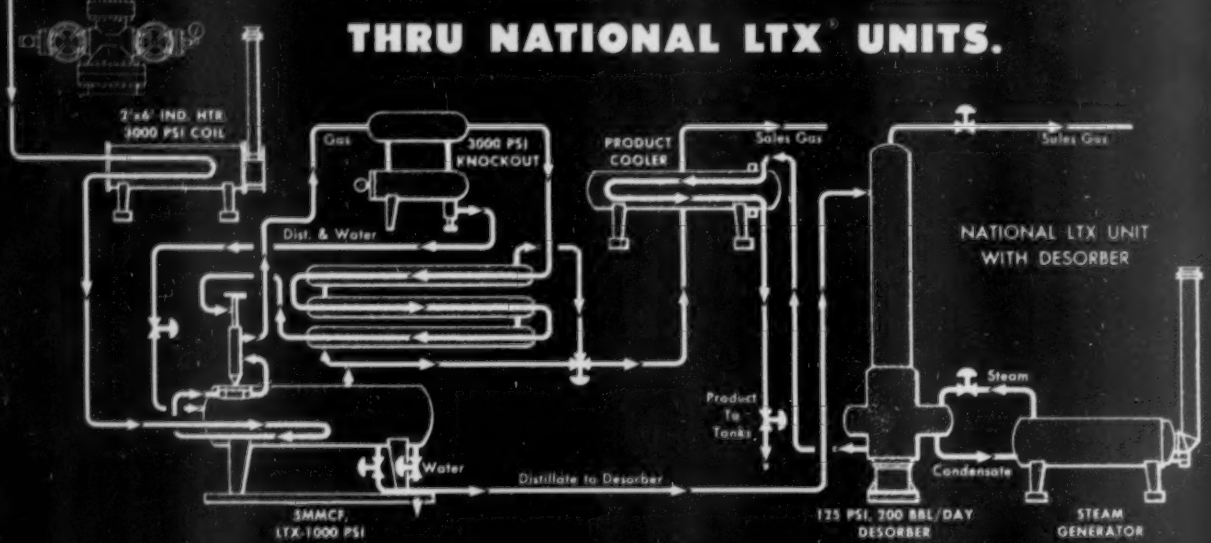

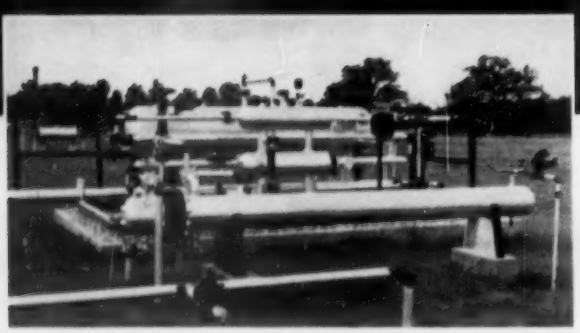

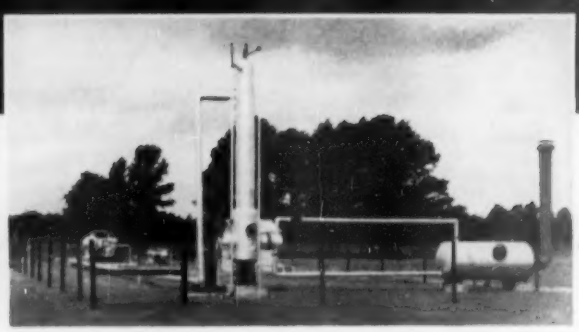

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